Railway Cotober 1945-19-19 Mechanical Engineer

See 3/

GREATER All-weather SAFETY
FOR THE TRAINMAN

with this GRIP



SAFE GRIP" LADDERS AND HANDHOLDS



freight cars are equipped with

UNIT TRUCKS

THE SWING

TO UNIT IS

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UNIT TRUCK CORPORATION
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ODORS Quickly Destroyed with

It's New!
Different
Economical
Safe!

OAKITE TRI-SAN

CLEANS . DECODORIZES - DISINFECTS . . . IN ONE OPERATION

Oakite TRI-SAN provides a LOW-COST answer to every rail-road's problem of quickly destroying odors in passenger coaches, smoking cars, troop and hospital trains . . . and CLEANING and DISINFECTING surfaces at the same time in ONE single operation.

Did we say LOW-COST? Yes . . . an ounce of Oakite TRI-SAN to a gallon of water makes a solution costing only one cent! Merely apply solution to surfaces with mop, brush or cloth. Oakite TRI-SAN has NO odor . . . leaves NONE. Comes in powder form, contains no poisonous or corrosive ingredients, is SAFE to use and handle. Write today . . . arrange for a demonstration on your road.

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Send for FREE 16-page booklet giving formulae and methods for using Oakite TRI-SAN.

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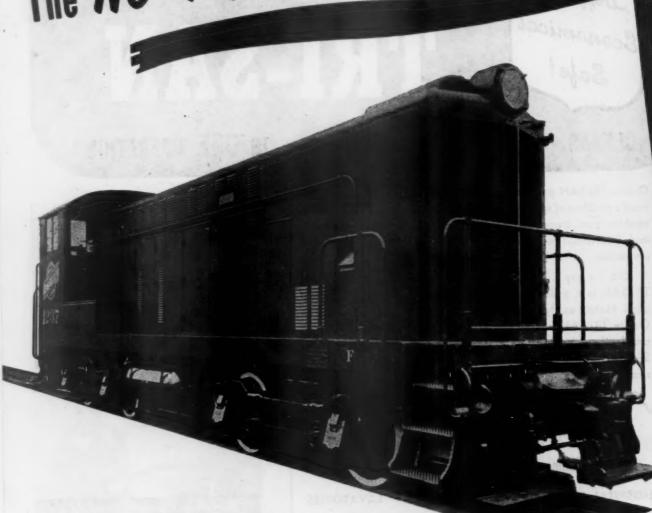
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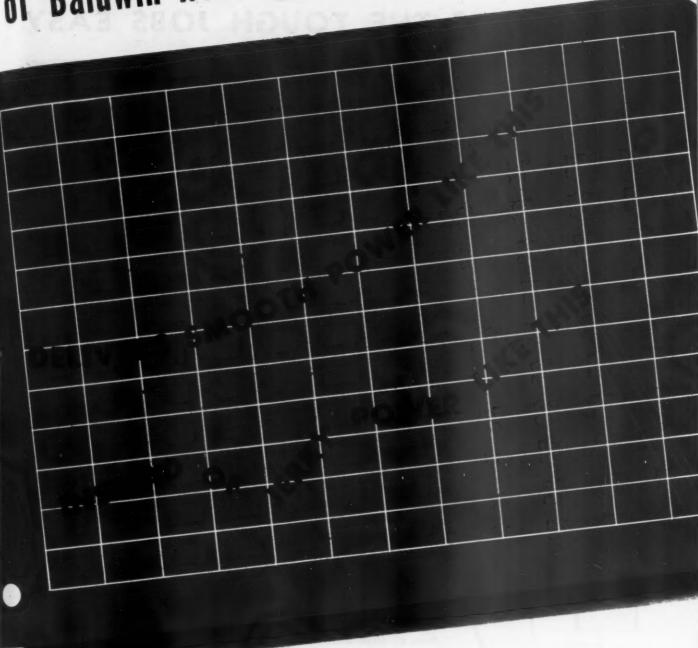
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BALDWAN LOCOMOTIVE WORKS, PHILADELPHIA Westinghouse

ELECTRIC CORPORATION, EAST PITTSBURGH, PA.

of Baldwin-Westinghouse Diesel-Electrics



One of the many impressive things about the performance of Baldwin-Westinghouse Diesel-Electrics is the way they accelerate. There's a smooth, even power flow, from the moment of starting up to full speed.

An exclusive B-W feature is responsible for this advantage. Instead of using electrical circuits with all motors in series for starting, and a transition (which momentarily cuts out two motors) to seriesparallel at a certain point, Baldwin-Westinghouse locomotives use the same series-parallel connection

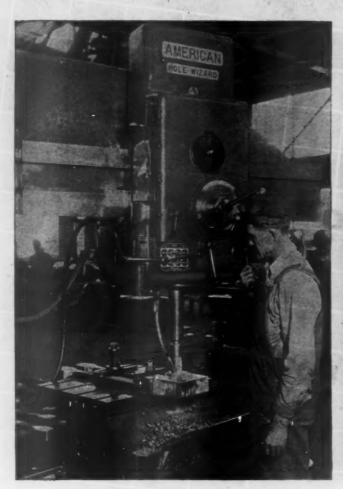
in starting . . . and in running. With no transition, there is no jerk to stress equipment or injure lading. This method of connection also permits the 1-3, 2-4 motor hook-up that automatically reduces power to slipping wheels, and increases it to the wheels with better traction.

Baldwin-Westinghouse Diesel-Electric Locomotives, now serving on 60 railroads, offer a number of exclusive advantages that pay out in high availability, low operating costs, and unusual working capacity. Ask for information.

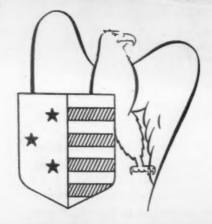
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THE EXTRA "PUNCH"

THAT MAKES THE TOUGH JOBS EASY







"AMERICAN" Hole Wizard Radials have that extra punch and extra stamina that mean so much when that tough job comes along. Many of the leading railroad shops can testify to this and are doing so by installing additional Hole Wizards.

To make "AMERICAN" Radials sound investments for the railroads we have kept our designs modern but have refrained from the complications so often encountered in the modernization of machine tools. Instead, we have chosen to emphasize the three cardinal factors which dominate the cost of producing work, namely, high-power input, structural ruggedness and ease of operation. As a result, "AMERICAN" Radial Drills offer high productive capacity with a low replacement and maintenance cost. We are convinced that railroad shops are best served by this type of equipment.

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Since it was first introduced in 1930, the "M-F" Water-tight Bolt has been popular with railroad men. It has performed its job so well that no change in design has ever been necessary.

Many millions are in service—adding years to the lives of freight cars and their ladings. They are identified by the V ring under the head.

Other "M-F" devices that insure tight car construction are Lock-tight Floor Clips, Speed Lock Nuts—No. 1 and No. 3, Lock Nuts, Collar Bolts.

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IN 1931 CLARK INSTALLED one of America's first electric furnaces for making steel. Since that day the name Clark has been identified with castings of unsurpassed excellence. Bottom pouring makes sure of pure metal. Precise metallurgical control of materials and heat treatment safeguards quality. Better castings result—often of intricate design, made to a wide variety of chemical and physical specifications.

In every casting is one unwritten specification vitally important, yet it adds nothing to cost: the enviable reputation of the Men of Clark.





FORK TRUCKS AND INDUSTRIAL TRACTORS



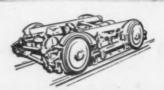
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One piece, forged, heat treated
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TRANSMISSIONS for Trucks, Busses, Tractors



CELFOR HIGH-SPEED DRILLS AND REAMERS



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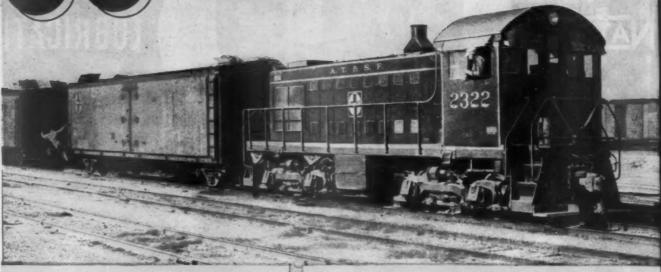
POTECTION

In the road and around the clack all under a season like motives on the Nortalk and Western are prolected by NATHAN complete Mechanical Lubrication. This includes a thorough job of chases lubrication, and as a result these locomotives have a
higher availability—lower muintenance and are
turned more quickly at engine terminal.

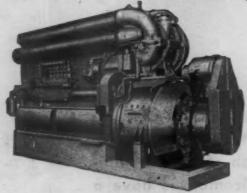
NATHAN MANUFACTURING CO., NEW YORK 17, N.Y.

Established 1861

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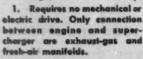
EXCLUSIVE ALCO-G.E DESIGN FEATURES PRODUCE



4-CYCLE DIESEL ENGINE - Working parts are strengthened by putting into them weight necessary for

- 1. Four-cycle design minimizes piston-pin wear and replacement because the reversal of load allows both sides of the pin to be lubricated.
- 2. There is no concentration of heat in the valve parts to shorten their life or require special cooling facilities. The three idle strokes after each combustion stroke allow ample time for cooling.
- 3. An automatic overspeed safety device prevents engine speeds of more than 15 per cent above the engine's top speed rating.
- 4. Engine and generator are built as a single unit to prevent misalignment.

5. The symmetrical cylinder liners have no ports, and they fit the straight, smooth bore accurately. gine's power output 50% by harnessing energy in waste exhaust pas. TURBO-CHARGER-boosts exhaust gas.





- 2. Has only one moving part which requires no servicing or
- 3. Operates automatically at all loads. Speed, pressure, and quantity of air very with engine load changes.
- 4. Pulsating exhaust pressure thoroughly scavenges burnt gases from cylinder, producing cooler engine parts.
- 5. Operates only when required—"floats on the line" the pest of the time.



DIRECT-CONNECTED GENERATOR-

makes engine's entire herse-power output available for traction, at all speeds.

1. Armature is a solid struc-ture built to withstand the high speed and lateral and torsional vibrations of the engine.

2. Armature is dynamically

2. Armature is dynamically

balanced before and after winding.

3. A single, self-aligning bearing supports the commutator and of the armature and provides sufficient clearance for armaure end play.

4. Separate main-field excitation, which maintains constant generator output at locomotive speeds, is supplied by a split-pole exciter.

Exceptionally large inspection holes make the commutator and brush rigging readily accessible.



AMERICAN LOCOMOTIVE

SAVINGS ..

proved by the 190,000-hour maintenance record of 21 Alco-G.E. units on 9 railroads

Colu oi =	Hours operated	\$30,988
Railroad Number of la	82,161 16,178 7,095 1 23,171 3 2,354 1 2,354 2 25 1 31,884 7,740 2 20,452	7,068 1,686 2,486 831 110 7,425 4,476 7,363

EXTRA STURDINESS ...

CONSTANT-OUTPUT TRACTION MOTORS—insure smooth, fast acceleration at all engine speeds.

- Exceptionally rigid armatures reduce wear on gears and pinions.
- 2. High torque characteristic and large thermal capacity absorb the everloads encountered in switching.



- Specially designed relay automatically transfers motor connections from series to series-parallel, thereby providing smooth, fast acceleration at both full and partial power.
- 4. Milled and gasketed gear-case joints permit the use of low-viscosity oil, which lubricates gears most effectively and thereby produce longer gear life.
- Automatic wheel-slip relay cuts off power from motors until slipping stops, then resumes power output.



INTERCHANGEABLE AND REVERSIBLE TRUCKS—are simple in design, and they equalize flange wear.

- 1. Sturdy, one-piece, caststeel frames meet railread requirements of simplicity and easy maintenance.
- Combination, semi-elliptical and coil springs thoroughly cushion roadbed shocks and insure smeeth riding.
- 3. Wheel hub liners are made unnecessary by the use of an exte and thrust bearing which is easily inspected and maintained through the journal box lid.
- 4. Bearings, collars, wedges, and covers are built into the side frame members. This eliminates the need for a moving pedestal box and avoids the maintenance of pedestal clearances.

PERATING records of 21 Alco-G.E. dieselelectric locomotives on nine railroads show that their average maintenance cost is 66 per cent less than that of steamers doing comparable work.

One eastern railroad, for example, has been operating eight Alco-G.E. 1000-hp units in both freight and passenger service since 1941. A comparison of their maintenance cost with that of steamers doing similar work showed that the diesel-electrics cost 17 cents less per mile in passenger service and 20 cents less per mile in freight service. Total maintenance savings amount to more than \$140,000 a year—20 per cent of the cost of the eight locomotives.

Savings like these are typical and can be generally expected when Alco-G.E. diesel-electrics replace steamers. The reasons why the savings are so high can be found in the experience-proved design and construction of each component and the care taken in matching the operating characteristics of each component to the others. G.E.'s electric drive, alone, has benefited from more than 50 years of steady improvement, and from experience with railroad operating conditions.

If you are considering what economies can be made in your operations through the use of diesel-electrics, we recommend starting with a motive-power study. Our engineers would like to collaborate with your organization to give you the benefit of our varied experience. We build and recommend all three types of motive power—diesel-electric, electric, and steam—each for the service in which it is economically best fitted.

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We judge good cleaners by performance!

And that's how good cleaners should formance under the toughest and most be judged.

For railroadmen know that in the stubborn grind of back shop work, what's needed are cleaners that pack a wallop . . . in chasing grease, oil, carbon and other deposits that must be removed.

Wyandotte Railway Cleaning Products are gaining an ever-increasing reputation for labor saving, speedy and reliable perexacting of conditions.

With much overworked equipment, with replacement stock hard to get, only the best in maintenance cleaning can help assure top-rolling efficiency. And that's where Wyandotte shines for you-with products specialized to meet every cleaning challenge. Talk over your problems with the Wyandotte Representative. He's always on call.

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Before you buy new hydraulic railroad shop equipment you should send for these latest W-S railroad bulletins—just off the press.

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W-S machines are no post-war experiment ... railroad shops have used and demanded W-S hydraulic equipment to do the job faster and longer for over 60 years.

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HYDRAULIC MACHINERY DIVISION

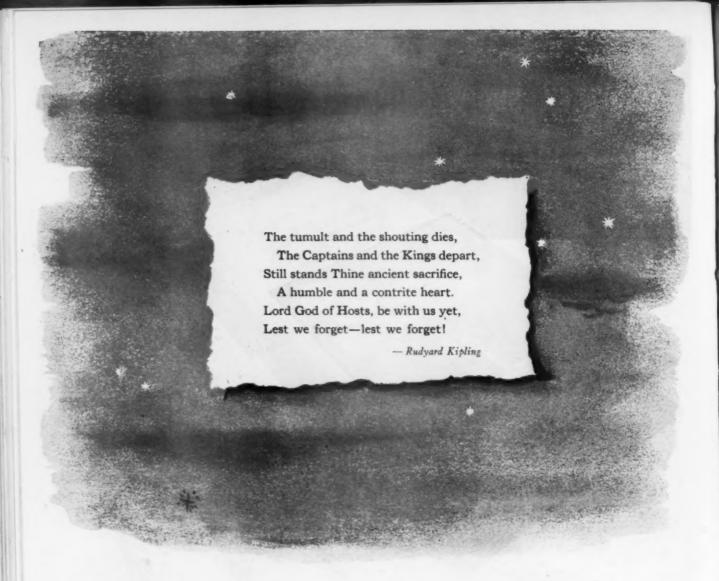
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You and we have worked together through four of the world's most tragic years. Our common interest in a common cause has strengthened old business friendships and has made many new ones. For this we are grateful.

This experience of mutual respect and confidence is one result of the war that will be carried over to the problems of peace. It is the very stuff that will assure profitable business at home and better relations with our neighbors abroad.

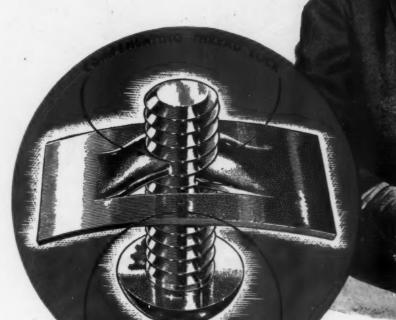
We of the Biddle Company fortunately have no factory problem of reconversion. For the most part, we make the same testing instruments for industry at peace as were required for war. And as more of our products become available for industrial and rehabilitation purposes, we will continue to serve you—in good faith always—and to the best of our ability.

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Only SPEED NUTS provide a COMPENSAT-ING thread lock and a SELF-ENERGIZING spring lock. As the screw is tightened the two arched prongs move inward to lock against the root of the screw thread. These free-acting prongs COMPENSATE for tolerance variations. Compression of the arch in prongs and base creates a SELF-ENERGIZ-ING spring lock. These two forces combine to definitely prevent vibration loosening.

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Finally, Purchasing Agents have learned that Tinnerman service is dependable. Unlimited production and service facilities assure the utmost cooperation in getting SPEED NUTS on their way to you...on time. Investigation will prove that SPEED NUTS should be YOUR first choice, too. Write for information today.

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P-G STEEL GRID RESISTORS

- * All Steel Construction
- * Mica Insulation
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These features combined insure long Resistor Service Life

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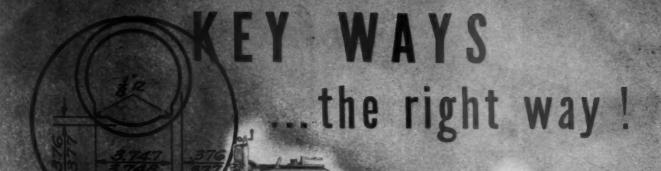


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THE POST-GLOVER ELECTRIC COMPANY

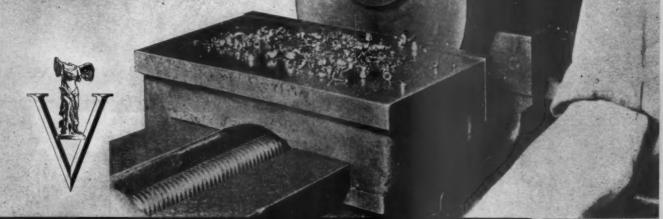
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function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

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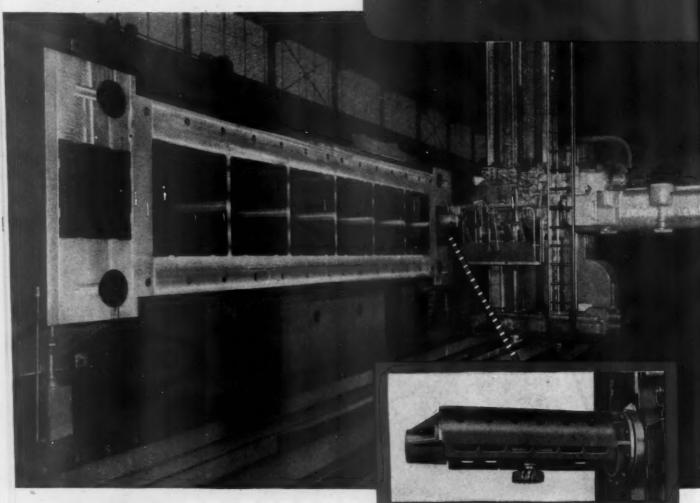


(Above) Small Press Bed Mounted on a Power Rotary Table. Only One Work Setting is Required to Machine This Bed.

(Below) Large Press Bed Machined on a G. & L. Floor-Type Machine.

(Inset) Spindle Support and Angular Milling Attachment for Machining Guides.

cuts machining time 50%







Right: G. & L. Table Type Machine.





OPEN CONSTRUCTION SIMPLIFIES VARIOUS OPERATIONS...EXTRA SETUP AND WORK HANDLING ELIMINATED...ACCURACY OF FINISHED PRODUCT IMPROVED

Massive weldments of all kinds are machined better and faster on G. & L. Horizontal Boring, Drilling and Milling Machines. Open floor-type construction plus timesaving attachments eliminates excessive work settings and simplifies machining operations.

Two typical press bed weldments are shown in the process of being machined. Size of the beds merely indicates the wide working range of G. & L. Floor-Type Machines. The larger press bed is 30 ft. long by 11 ft. wide and the upper surface is shown completely milled, drilled and bored. Through the use of a spindle support arm and angular milling attachment, the guides of the press bed are being machined without changing the work from the original setup.

Overall Machining Time Reduced from 90 to 45 Hours on Small Press Bed

Floor-to-floor time was cut in half by using a G. & L. Floor-Type Machine equipped with a rotary table. The sequence of operations on the 140" x 112" bed weldment includes (1) Surface milling cut; (2) Keyseating cut; (3) Milling bottom of bed after table is indexed 180°; (4) Milling guides by using a standard angular milling attachment. Only one setup was required to complete all operations accounting for the saving in overall time.

Increase Production...Reduce Costs

If you are confronted with the difficult task of machining large, bulky, hard-to-handle weldments or machinery components, G. & L. Horizontal Boring Machines will solve your production and machining problems. Consult Giddings & Lewis engineers now regarding the use of these versatile machines. They can help you convert expensive machining operations into profitable production.

Our engineers are ready to assist you in adapting war surplus Giddings & Lewis equipment to your needs.

MACHINE TOOL CO.

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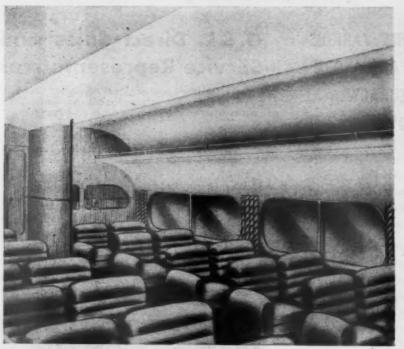
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Good lamps are the heart of good lighting

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GE MAZDA LAMPS



ELECTRIC

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"The G-E Houseparty," Monday through Friday 4:00 p. m. EWT, CBS.

Octobe

An Important Statement of Policy

FOR years, Warner & Swasey has taken the position that its responsibility does not end with the delivery of a Warner & Swasey machine. We will continue this policy throughout this period when many government-owned surplus Warner & Swasey Turret Lathes are passing through many hands.



Besides the obligation we owe a Warner

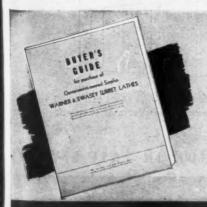
& Swasey owner, wherever he may be, we also have a deep interest in a sound, efficient, postwar national economy. It is our belief that low-cost high-production is vital to such an economy—and that means using the most efficient methods and tools available.

Warner & Swasey Maintains Records of Every Warner & Swasey Machine in Service

Given model and serial number, your nearest Warner & Swasey Branch Office can tell you when the machine went into service, what special specifications were involved—what original equipment, accessories and tools were included.

They can aid you further by giving you a re-

port. Knowing the jobs you expect to use these turret lathes on will enable them to advise you whether the machine will serve you capably, or whether it would handicap your future production when compared to other possibilities for doing your job better.



SEND FOR FREE COPY

The "Buyers Guide" will prove a valuable aid in helping you determine the proper Warner & Swasey Turret Lathe to suit your needs in the purchase of surplus turret lathes. To get a copy, just write to us here in Cleveland or contact your nearest Warner & Swasey Branch Office.

You can Machine it Better, Faster, for Less... with a Warner & Swasey

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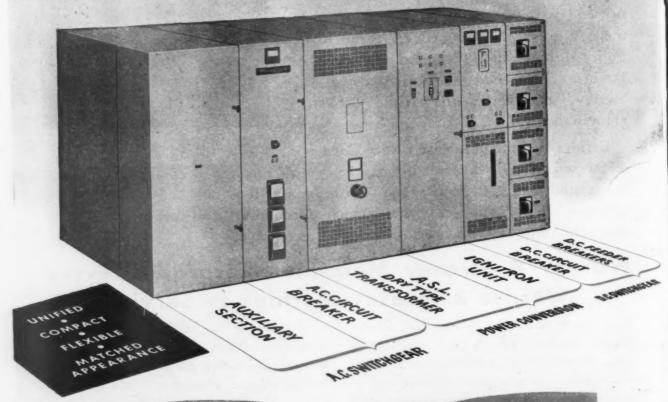
TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINES

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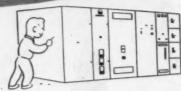
Announcing...
the Westinghouse 1946 Model





It's easy to install. Just move it in on any reasonably level floor. No special foundation or reinforcing is required; can be installed even on balconies . . .

CONNECT IT ...



Simply connect the control leads, power leads and water supplyand it's ready to go to work. No air ducts or ventilating systems are required . . .

TIMES AS MANY RECTIFIERS PUT INTO OPERATION IN LAST 3 YEARS



Westinghouse - HEST AND

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Power Conversion at its BEST

for Economical, Efficient Power Conversion A-C to D-C

75 to 500 Kw-250-volt Class 100 to 1000 Kw-600-volt Class Special Voltage Applications

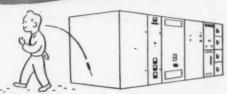
The Westinghouse Sealed Tube Ignitron Unit Substation combines efficient, dependable power conversion equipment in a completely metal enclosed compact unit. The Ignitron Tubes, permanently evacuated and sealed at the factory, eliminate the need for vacuum maintaining equipment . . . thereby reducing maintenance to a minimum.

The lighter, more compact, dry-type ASL Transformer removes the disadvantages of liquid filled equipment and eliminates fire hazard completely.

The Westinghouse 1946 model Ignitron Unit Substation, employing the ASL Transformer, requires less floor space per kw than any other conversion equipment. Completely assembled at the factory, it provides easy installation and makes future relocation a simple

CONSULT WESTINGHOUSE—Call your nearest Westinghouse office or write for B-3646—"POWER CON-VERSION AT ITS BEST"-Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.





These Westinghouse Unit Substations can operate unattended, with ractically no maintenance. Operation is quiet-there is no vibration. High load swings are readily handled. Momentary overloads, or even short circuits cause no damage.

. . AS IN THE PREVIOUS 15 YEARS



OF THIS IDEAL POWER UNIT

- **Factory** assembled
- High efficiency
- Requires NO special foundation
- Easy to install or relocate
- No special air cooling requirements
- Quiet operation... No vibration
- No starting inrush
- Low maintenance
- Instant power upon demand
- Any load demand any time, or full time

WESTINGHOUSE IGNITRON PRINCIPLE



provides a reliable method of starting an arc in a few micro-seconds, at the beginning of each conducting period and permits the arc to extinguish when the anode is not conducting current

Each anode, with its own cathode, is mounted in a separate chamber; shields are reduced to a minimum, thereby

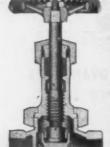
ctronics at Work

5

Need A. A. R. valves and fittings? ... choose from the CRANE

ONE SOURCE OF SUPPLY . ONE RESPONSIBILITY . ONE STANDARD OF QUALITY

300-Pound A.A.R. Brass Globe and Angle Valves



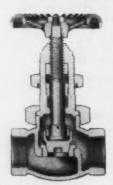
No. 376P

INSIDE SCREW TYPE

Made with plug or ball type disc, in sizes from ¼ to 2 in. female inlet and outlet, male or female inlet with female union outlet. Body is Crane Special Brass; bonnet of highly wear-resistant bronze. Seating materials in plug type disc valves are-Monel metal to Exelloy in sizes up to 1/2 in.; Nickel Alloy to Exelloy in sizes % in. and larger. In ball type disc valves: Monel metal to Exelloy in sizes up to 1/4 in., while 1/4 in. and larger have both disc and seat ring of Nickel Alloy. For complete specifications, see page 42 of your Crane Catalog.

300-Pound A.A.R. Brass Globe Valves

OUTSIDE SCREW AND YOKE



No. 396P

These valves come in sizes from 1/4 to 2 in., and have the famous hardwearing, leak-resisting Crane plug type disc with Nickel Alloy to Exelloy seating materials. For extra strength in the stem, Crane uses 18-8-Mo Chrome Nickel Alloy Steel. Body is Crane special Brass; with Cast Manganese Bronze in the bonnet. Parts of these valves are interchangeable with Crane A. A. R. inside screw globe valves except stem, bonnet, gland and gland nut. See page 44 of your Crane Catalog for complete specifications.

A.A.R. Malleable Iron Unions and Union Fittings

WORKING PRESSURE: 300 Pounds Steam, 550° F.

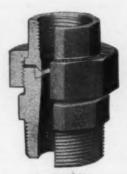


No. 890E

Here are female end or male and female unions, 90° or 45° elbows, and tees with union on either run or outlet end. In straight sizes from ¼ to 3 in. Reducing tees in sizes up to 1 x % in. Reducing (air pump) unions up to 2 x 11/2 in. These fittings have brass-to-iron ground joint seat. Steel tailpiece fittings have brass-to-steel ground joint seat, and provide additional strength under severe working conditions. See pages 242, 243, 244 of your Crane Catalog.

A.A.R. Forged Steel **Ground Joint Unions**

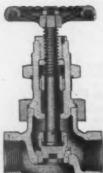
WORKING PRESSURE: 300 Pounds Steam



No. 95314H

With ground joint, brass-to-steel seat. these unions are made in female end. and Reducing Air Pump patterns with larger male end. Extra rugged. Recommended for locomotive and car piping subjected to vibration. expansion and contraction. Corresponding parts interchangeable with other Crane A. A. R. unions. Female end pattern sizes, % to 3 in., reducing type, 11/4 x 1 to 2 x 11/4 in. See page 244 of your Crane Catalog.

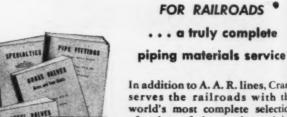
600-Pound Alloy Cast Steel Globe Valves

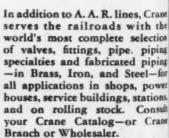


OUTSIDE SCREW AND YOKE

Working Pressure: 600 lbs. Steam, 750° F.

Patterned after A. A. R. 300-Pound O S & Y Brass Valves. Designed for high pressure superheated steam service on locomotives. Have wide-bearing plug type disc and seat, ideal for throttling, with No. 49 Nickel Alloyto-Exelloy seating materials. Body and bonnet are Crane No. 4 Carbon-Molybdenum alloy steel; with Exelloy stem. Made in sizes from 1/4 to 2 in., with female inlet and outlet, male or female inlet with female union outlet. See page 311 of your Crane Catalog.





CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers Serving All Industrial Areas

CRANE PLUMBING . HEATING . PUMPS



THEY'RE RUGGED AND VIBRATION-PROOF

WHAT A BREAK FOR THE MAINTENANCE CREW

WE HAVE USED THEM TO GOOD ADVANTAGE BEFORE





DZUS IS SAFE AND THOROUGHLY DEPENDABLE

Yes, Dzus spiral cam fasteners can solve your fastening problems, too, for any hinged or removable part that acts as an access door or cover.

These fasteners are easy to install, easy to operate and positive in action — only a quarter turn to open or lock. They are rugged, long-lived, vibration-proof and permanently attached — nothing to lose, no threads to strip. They can be used to fasten any metal, wood, fiber or plastic.

Dzus fasteners are available in a wide range of sizes, head styles and materials to meet the requirements of all industries. Send for our catalog. It contains full descriptions, specifications and many illustrated applications.

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• One of the really new air moving units on the market, the Buffalo "CC", Centrifugal Compressor, has wide industrial applications. Developed by Buffalo to meet the need for a single stage high pressure blower, the "CC" has amazing performance ability. Since both rotors and housings are "tailor-made" to fit the job — you

can get just the amount of air you need at the pressure required. And because, with the aid of the Buffalo Vacuum Test Pit, our engineers have checked all rotors for safe operation, you get a blower which is certain to perform according to specification. If you are interested in details, send for Bulletin 3553.

BUFFALO FORGE COMPANY

174 Mortimer Street

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Buffalo, N. Y.

TYPE CC CENTRIFICAL COMPRESSORS



is handled smoothly with flexible YELLOW STRAND BRAIDED SLINGS* When you're hurrying equipment back into service, you want help from a sling, not hindrance. What you need in repair shop,

yard, stores department or out on the wrecker is the convenience of Yellow Strand Braided Safety Slings. Their flexibility, kinkresistance and ease of handling enable men to make smooth, fast pickups with confidence. The lifts illustrated—Diesel locomotive, driving rod, superheater units and trailer wheels - are typical of

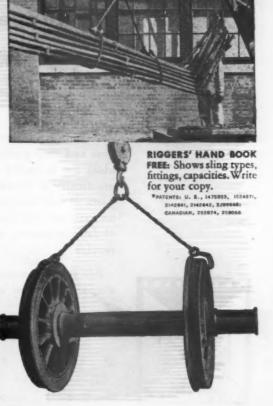
hundreds performed daily by leading railroads.

Patented braiding puts added limberness into strong, durable Yellow Strand Wire Rope. The sling conforms to irregular shapes, grips curved objects firmly, takes fittings readily. Popular special designs include drawbar, mounted wheel and drum slings. Weighing less than chain, braided slings are easily carried and applied, using minimum manpower. Crews welcome their security on big tonnage lifts, their Manila-like pliability for small jobs.

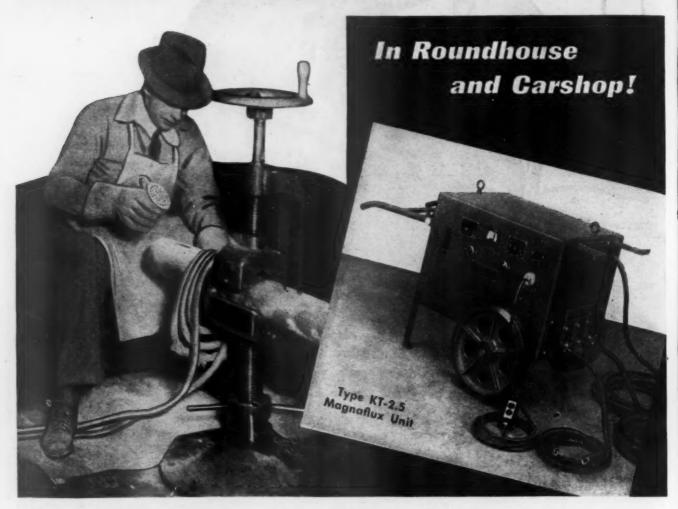
Yellow Strand Braided Slings are practicable for loads ranging from salvage parts to your costliest locomotive. Investigate today.

Broderick & Bascom Rope Co., St. Louis 15, Mo. Branches: New York, Chicago, Houston, Portland, Seattle. Factories: St. Louis, Seattle, Peoria.





LOW-COST OVERHAUL INSPECTION



A New, Rugged "Push-Cart Style"

MAGNAFLUX* UNIT

(Price Complete, \$455.00, F.O.B. Chicago)

● Inexpensive, highly mobile—this new and very practical Magnaflux unit is ideal for magnetic particle inspection of practically all locomotive, car and similar parts. It was designed for use particularly on railroad equipment, for the location of fatigue cracks, and prevent failure in service.

All roundhouses, carshops and backshops—even the smaller ones—can use this Type KT-2.5 unit to profitable advantage. Its rugged, compact, welded all-steel frame will stand a lot of shop punishment. Convenient push-cart style with folding handle bars and 16-inch rubber tired wheels . . . Also equipped with heavy eyebolts to facilitate handling with an overhead crane.

Safety demands the thorough inspection that Magnaflux equipment provides.



*Magnaflux—the Trede Mark of the Magnaflux Corporation applied to its equipment, materials and magnetic particle inspection, which are sold only for licensed use.

MAGNAFLUX CORPORATION

New York

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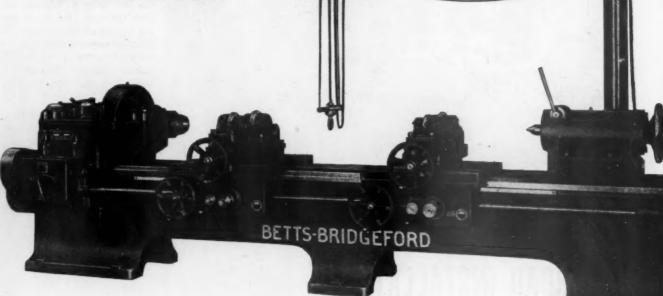
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A Betts-Bridgeford Burnishing Lathe will help to keep your rolling stock rolling....longer





Among Railroad Tools built by Consolidated are . . .

CAR WHEEL BORERS
BURNISHING LATHES
TIRE MILLS
END DRIVE AXLE LATHES
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JOURNAL TRUNO LATHES
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AND OTHERS

A rugged, powerful machine designed with sufficient metal, properly distributed, to provide full rigidity and insure accuracy. Fast . . . easy to operate.

Burnishes journals and dust guards of standard AAR car axles in sizes from $4\frac{1}{4}$ " x 8" to $6\frac{1}{2}$ " x 12" inclusive. Equipped with two sets of opposed burnishing rollers, it burnishes both ends of the axle simultaneously.

BUILDERS OF RAILROAD SHOP TOOLS SINCE 1861

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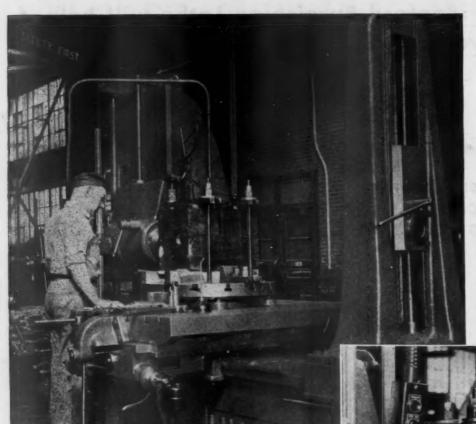
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CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



THIS 4" spindle No. 42 LUCAS Horizontal Boring, Drilling and Milling Machine has just been installed in a vitally important locomotive shop and has been doing a "bang-up" job right from the start. Due to its versatility and because its cost-saving scope of applications covers so many jobs, it is very often referred to as the "Indispensable Railroad Machine." Two other LUCAS Machines are installed in this same shop.

One of the Latest
RAILROAD INSTALLATIONS
of the No. 42

LUCAS

HORIZONTAL BORING MACHINE

HERE the LUCAS is shown machining a set of hard tempered steel dies for car brake hangers. All machine operations, with the exception of the outside flat surface, are done on this machine including a keyseat in both halves 7/16" deep and 15/16" wide. The die set is easily mounted on the revolving table and rotated to the proper angles. Only three set-ups are required. One set-up is required to bore three

holes with die halves together to permit grip—one set-up to bore all other holes without grip, and another set-up for each block separately to bore 31/4" holes at right angles.

Write for circular A-74. It explains the details and many advantages of this powerful, versatile, convenient and accurate machine.

LUCAS MACHINE TOOL CO.



CAR WHEEL BORER EASY TO OPERATE



The Niles Hydraulic feed wheel borer will rough, finish machine and chamfer the bore, also face the hub of cast iron or steel wheels with a minimum of machining time and effort on the part of the operator.

Write for Catalogue Covering Complete Line of Niles Tools including driving wheel lathes, car wheel lathes, car axle lathes, car journal turning lathes, locomotive journal turning lathes and locomotive wheel quartering machines.



GENERAL MACHINERY CORPORATION HAMILTON, OHIO, U. S. A.

The Niles Tool Works Company

General Machinery Ordnance Corporation

OLIVER RAILROAD FASTENERS

Help make better Post-War Cars or Locomotives



Alloy steels, heat treatments, modern manufacturing methods and other technical advances found in Oliver Railroad Fasteners are distinctly helpful in working out improved designs for post-war railroad equipment. Higher tensile and fatigue strengths permit overall weight reductions. Improved manufacture means better fits, tighter joints.

For car and locomotive work, Oliver provides studs, bolts, nuts and rivets especially designed for railroad service. Ask your Oliver representative



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VALVES AND RAILROADS

WALWORTH BRONZE AAR LOCOMOTIVE VALVES

Bronze Globe and Angle Valves for superheated steam up to 300 psi at 550F, and up to 600 psi WOG.

WALWORTH MONEL VALVES

Cast monel bodies with 500 Brinell seat and disc. For superheated steam service up to 400 psi at 750F.

WALSEAL BRONZE VALVES AND FITTINGS

Threadless bronze valves and fittings for making strong, vibration-proof Silbraz Joints on Copper and Brass lines.

WALWORTH BRONZE VALVES For every service where bronze valves are used. Gate, Globe, Angle, and Swing Check types, screwed or flanged ends.

WALWORTH

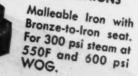
STEEL VALVES

Gate, Globe, Angle, and Check types for services up to 1500 psi steam at 950F, and 5000 psi WOG.

WALWORTH LUBRICATED PLUG VALVES

For handling air and oil lines. Quarter turn opens or closes. Lubricant prevents leakage. Available screwed or flanged ends.

WALWORTH AAR UNIONS

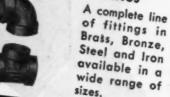


WALWORTH AAR UNION **FITTINGS**



with Bronze-to-Iron seat. For 300 psi steam at 550F, and for 600 psi WOG.

WALWORTH FITTINGS



· · · many other piping products. Catalog 42 describes all Walworth products. Send for your free copy.

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Write us for a FREE copy of the bulletin "Unit Loads," prepared by The Electric Industrial Truck Association. It tells how to cut handling costs up to 50%... covers latest developments in materials handling... and includes actual case histories.





THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32 · Exide Batteries of Canada, Limited, Toronto

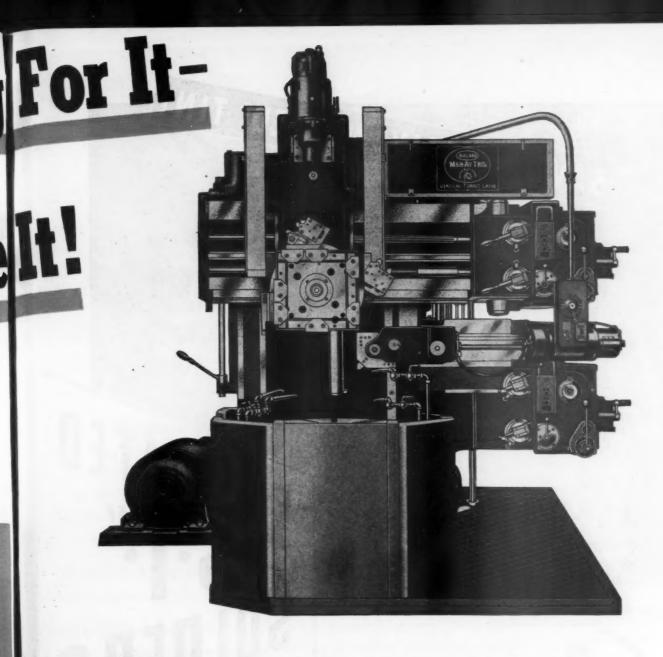
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You Have Been Waiting

BULLARD MAN-AU-TROL We Have

The Cut Master V.T.L. has made a big hit in a number of large shops. It possesses many features which offer unusual savings in production costs. These features include greater power, higher speeds, greater variety of feeds, more cutting heads, simplified controls, automatic stops and many other new developments. This unit can be obtained with the new MAN-AU-TROL. Do not specify a boring mill until you have made a thorough investigation of the latest BULLARD developments.





The Automatic Control that is as Versatile as Manual Control

TOMORROW'S industrial problems have been the chief concern of BULLARD Engineers. This is an old BULLARD progressive policy which is well known by all railroad shop supervisors.

Today you can plan for tomorrow's requirements—the new BULLARD MAN-AU-TROL V.T.L.—the new automatic unit that you have been waiting for.

It differs from ordinary automatic machines because of its versatility — manual or automatic op-

eration. It is not committed to any definite sequence of functions until the operator runs one piece through completely — manually brings the tools through each cut — and a MAN-AU-TROL setting at the end of each cut.

After the first piece is finished the operator moves a single lever and the MAN-AU-TROL takes over — performs all operations automatically — doing the work faster and more accurately than manual operation. You have been waiting for it! We have it! Send for detailed information.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



Automatic Pressure Testing machine. Courtesy: Continental Can Company

FEDERATED "S.T." SOLDERS



AVAILABLE

... for immediate solution of your soldering problems!

TEMP

METALS DIVISION

During this critical shortage of tin, which now is even greater than in previous years of the war, Federated low-tin and tin-free solders are doing yeoman service in meeting today's soldering requirements.

No matter what your production problem—whether it be the high speed soldering of cans at the rate of several hundred per minute, sheet metal work, radio, fine electrical soldering or general repairing—you'll find "S.T." SOLDERS an efficient, dependable answer.

"S.T." SOLDERS are available in all commercial forms, including acid and rosin core wire. For details on the complete range and properties of these solders, or for technical assistance on a specific problem, contact our nearest office.

2

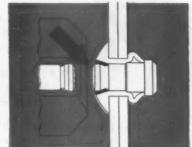


Huck BLIND RIVERS will do it FASTER

HUCK Blind Rivets offer great time-saving possibilities for ALL blind riveting applications, and for many jobs where SOLID rivets might ordinarily be used. These rivets are driven very quickly by a single operator. (Any

operator can easily drive several Huck Blind Rivets in the time required to read this paragraph.) In addition—

No Trimming Required. The rivet is driven by means of a pin which is pulled through the rivet sleeve by a pneumatic gun. At the end of the driving operation, the pin is automatically broken off, substantially flush with the head of the sleeve. There is no projecting end left to be cut off in a separate operation.



Rapid Inspection. Driven Huck Blind Rivets can be inspected simply by examining the manufactured rivet head on the accessible side of the work.

No Wobble. The jaws of the rivet gun hold the rivet *rigidly centralized*. Once inserted in the gun, the rivet cannot wobble, fall out, or move so as to cause improper engagement of the pin by the gun jaws. This obviously permits trouble-free handling and faster installation, particularly in riveting hard-to-reach and overhead holes.

These exclusive features too!

Bulbed Billed Head. Because of a patented work-hardening precess, the sloove and uponts to form a bulbed blind head rather than flaring out into a rulip head. This action (1) pulls the sheets tightly together; (2) provides ample surface centest between blind head and work; and (3) eliminates all possibility of splitting the blind head.

Positive Machanical Locks Rigidly and permanently locks rivet pin to sleeve. Gives driven rivet a strength comparable to that of a solid rivet, and prevents pin from working out under any conditions. The greatly increased tensile strength of the rivet is reflected in much higher ultimate strength of single-shear joints of sheets of a thickness less than that required to develop

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We get better welds and more of them since we bought "Bumblebees"

- Production increases of 15% to 30% without sacrifice of quality are common.
- They consume 30% to 35% less power than D.C. welders

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- They provide leading kva which neutralize lagging kva caused by other equipment, relieving overloaded power lines and cutting demand charges 10% to 30%.
- Because of freedom from arc blow, deposition rates can be speeded up by increasing the amperage. This often makes it possible to use larger, longer electrodes and cut down stub end losses.
- Absence of moving parts, tough, he-man construction and top-notch insulation assure dependable, trouble-free operation — eliminate shutdowns for repairs and replacements.

It's easy to do a swell welding job with a "Bumblebee" at the other end of the cable.

- There's almost no "arc blow". You can work faster in any position and you're sure of good, sound welds every time.
- It's easy to produce sound, uniform welds in the corners and tight spots—there's less chipping out of welds.
- It's often possible to use longer and larger electrodes; there are fewer stops to put new electrodes in the holder.
- It's a simple matter to adjust the current for different kinds of work just turn the crank.
- The current setting is always plainly visible on the big easy-to-read indicator.
- They're dependable don't require oiling or other attention. An operator can concentrate on welding.
- These are a few of the important advantages which are making "Bumblebee" welders favorites in plants everywhere. Others are described in the "Bumblebee" Catalog. Ask your nearest Airco office for a copy or write Dept. RM, Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

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ARC WELDER

WITH THE PENETRATING, STINGING ARC

A COMPLETE LINE OF A.C., D.C. AND GAS-ENGINE DRIVEN UNITS



HOW MANY GALLONS OF 50¢ OIL CAN YOU BUY FOR ONE DOLLAR?







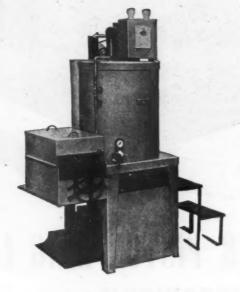




THREE...OR FOUR OR MORE...RIGHT!

THIS DOES IT





THE YM OIL REFINER

This is one of the new models of the YM Oil Refiner. Units are available in many sizes.

The YM unit is not a mere filter — it's a real oil refiner!

The YM Refiner removes all of these contaminants: fuel dilution; water, even when emulsified; gums, asphaltic materials, "gunk" that's dissolved in the oil itself. It brings acidity down to new oil values.

And it does all these things economically...without

any pre-settling or pre-treatment!

With the YM Refiner, you use the same oil over and over again...no need to discard a single quart. And your machinery is safeguarded from the damage that contaminated oil can cause.

Another point: oil refined in the YM unit is outstanding in anti-varnish properties. The YM removes sludge accumulations-prevents their formation. Oil refined in a YM unit is aged ... more stable.

You can use the YM unit to restore used lubricating oils—cutting and hydraulic oils—transformer oils-Diesel and gasoline engine oils. Users near you can tell you how effectively the YM Oil Refiner has served them.

And we'll be glad to show you how much you can save by its use!

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Save OIL ... and you save MACHINERY

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MAIL THE COUPON FOR FURTHER DETAILS

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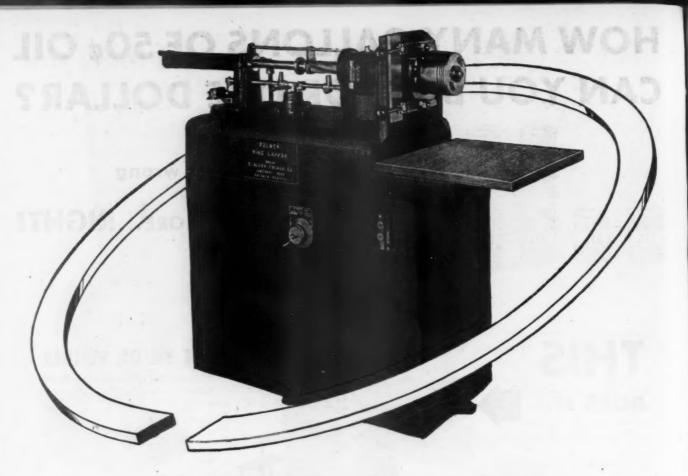
Please send me further information about the YM

Oil Refiner.

Company.....

Street Address.....

City and State.....



FULMER PISTON RING LAPPER **ELIMINATES GUESSWORK** in Fitting Piston Rings!

The Fulmer Piston Ring Lapper greatly simplifies the fitting of cylinders and rings, or pistons and cylinders to assure maximum sealing efficiency at low cost.

It eliminates guesswork, reduces "break-in" time from hours to minutes, and saves tearing down equipment because rings or pistons do not seal properly.

The Fulmer Piston Ring Lapper is especially recommended for proper fitting of pistons and rings in such equipment as Diesel and gas engines; piston, triple, brake control, fuel control and spray valves; fuel injectors and other applications where perfect fit is required.

Even with unskilled labor, the Fulmer Piston Ring Lapper will quickly lap full sets of rings into their cylinder sleeves, to a 100% bearing.

By using the Fulmer Piston Ring Lapper peak performance is obtained in the shortest possible time. Because of the great saving of time and vastly improved performance, Fulmer Piston Ring Lappers are widely used by the Army, Navy and Lend-Lease.

Write Today for Complete Information C. ALLEN FULMER COMPANY

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DEALERS: A few attractive territories remain open. Write today!

HONING MACHINES . RING LAPPERS . CENTRIFUGAL CASTING MACHINES

for faster handling of railroad material



Runs all day on a gallon of gallon of

 ${f T}$ he BUDA Chore Boy "eats up" heavy hauling trips around railroad shops and yards. It will push, pull, or carry unwieldy tools and materials at a 15 m.p.h. clip up steep ramps, down narrow aisles, over rough ground—all on a single gallon of gas a day! No batteries to charge, automatic safety stop. Investigate now. Send today for illustrated bulletins.

"Lowest First Cost . . . Davis Lowest Maintenance Cost!"



BUDA Track Liner



BUDA
"All Purpose" Jacks BUDA Rail Bender





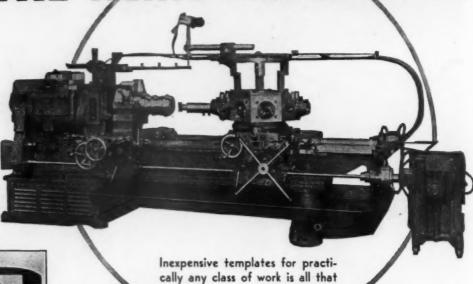
15407 Commercial Avenue HARVEY (Chicago Suburb) ILLINOIS



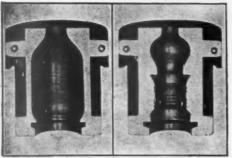
BUDA Tie Nipper

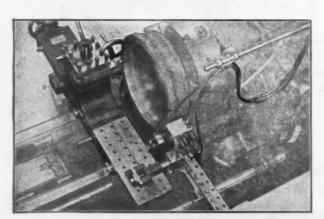
Something New!

WITH THE APPLE DUPLIMATIC



is required for the different jobs.





A new development in low cost contour turning and boring for Plastic, Glass and Rubber Molds; all types of Dies. No shapes too difficult.

Through the means of a push button station, the duplicating equipment can be disengaged, and the machine is then ready for standard turret lathe work.

If you are interested in lowering the cost on your present methods for this type production—we can help you. It's a subject for our engineers—so—send us your problems. No obligation—of course.

AFRICTA E MACHINE TOOL Co.



EVERAL years ago, in a Pittsburgh electrical manufacturing plant, a disc or "cookie" die was placed in operation. It was made of Diecarb, Firth-Sterling's newest, original, sintered carbide development for blanking dies. This "cookie" die blanked a circle of silicon electrical sheet .025 inch thick, to be sed in rotors and stators.

It proved so successful that since then two other similar Diecarb dies have been put to work—all averaging 50 to 60 million blanks per grind, as compared with 90,000 pieces per grind with high speed steel dies.

GET IN TOUCH WITH US

A complete Diecarb engineering service is at your call—for designing complete dies; for aiding in application of Diecarb to die shoes by brazing; shrink-fitting; press fitting and mechanical matrix; and for proper grinding.

The original die, at the latest count, had produced the unprecedented total of over a half billion stampings, and was still going!

In fact, the life of these remarkable Diecarb dies is not yet determined because all dies so far made are still in use.

Diecarb can be used for blanking and forming a diversity of materials including metals, plastics, paper, etc. It operates successfully on thicknesses up to 7/16 inch. It is proving unmatchable for high production operations, saving both downtime and maintenance.

If you have a product that requires blanking or if you are planning one—call in Firth-Sterling now to test the possibilities of Diecarb.

Firth-Sterling

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA PHTTSBURGN • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

Car Wheel Demounting Records

40 Seconds

Floor - to - floor

72 Seconds

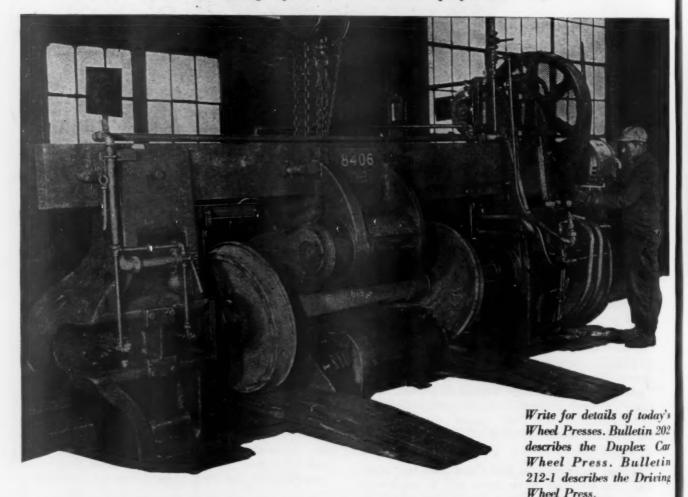
for Mounting

Chambersburg Wheel Presses have established records in railroads shops all over the country for the speed with which they permit the rapid mounting or demounting of wheels. On the car wheel presses, records have been made for demounting wheels as low as 40 seconds per

wheel floor-to-floor-mounting time as rapid as 72 seconds.

These presses have been designed and improved with the needs of the railroad shop constantly in mind-the necessity for speed in getting car wheels back in service has been paramount.

(Below) Chambersburg Duplex Car Wheel Press in shops of L. & N. R. R.



CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.



CHAMBERSBURG

HAMMERS - CECOSTAMPS -

Siere Ciene for your clamp problems!

ANID-ET

INDUSTRIAL PRESSURE CLAMPS OF ALL DIAMETERS FORMED FROM CONTINUOUS ROLL OF BAND-IT BAND

With BAND-IT Clamps, for a few cents-in a few seconds, you can handle any permanent or emergency clamping job from 1/2 in. to 30 ft. in diameter, BAND-ITS stop leaks-repair, conserve, and extend the usefulness of hose, steel pipe, tanks, electrical cable, wooden beams, etc. If you need clamps in your business, you need BAND-ITS.



PERFECT HOSE CLAMP

PIPE REPAIR CLAMP

BAND-IT CLAMPS Combine More Advantages Than Any Other Clamp! Speedy BAND-IT Clamps Speedy repair leaky pipe, hose, tanks right on the spot in a few seconds' time. No need to a large stock of different size preformed clamps. Speedy BAND-IT Clamps With BAND-ITS No need for a large stock of diameter from 1/2 inch to 30 diameter from 1/2 inch to 30 diameter from 1/3 inch to 30 diameter from 1/3 inch to 30 diameter from 1/4 inch to 30 diameter from 1/

repair leaky pipe, hose, tanks right on the spot in a few seconds' time. No need to tear down or disconnect equipment.

Every clamp is formed and fitted on the job from continuous 100-ft. roll of BAND-IT

Steel Band.

BAND-IT Band, clamps of any diameter from ½ inch to 30 ft. may be formed. This offers an endless number of both permanent and emergency uses to every type of industry.



THERE'S A PLACE IN YOUR BUSINESS FOR THE NEW

A COMPLETE CLAMP KIT FOR YOUR OWN SHOP

Holds 850 industrial pressure clamps any diameter in less than ONE CUBIC FOOT of space! Keeps BAND-IT Tool, Band, and Buckles handy, in ONE clamp service kit.



C

202 Car tin ing

LEER



Selected as original equipment for machining contours of Fairbanks-Morse diesel engine blower impellers, the installation of Rockford Hy-Draulic Shaper-Planers has grown to include the 8 machines shown above. For several years they have been running more than double time daily, and operating personnel has included several women. When permitted by the impeller schedule, several of the Shaper-Planers have been reverted to standard and used on high-priority tool and die work.

Rockford Hy-Draulic Shaper-Planers machine many other kinds of blower impellers and work-pieces having irregular shapes or contours. Hy-Draulic Shapers and Planers handle similar work in smaller and larger sizes respectively. They, too, can be reverted to standard for conventional shaping and planing. Investigate. Send drawings or samples for a sales engineering production proposal. Write to Department 1924.



451

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS





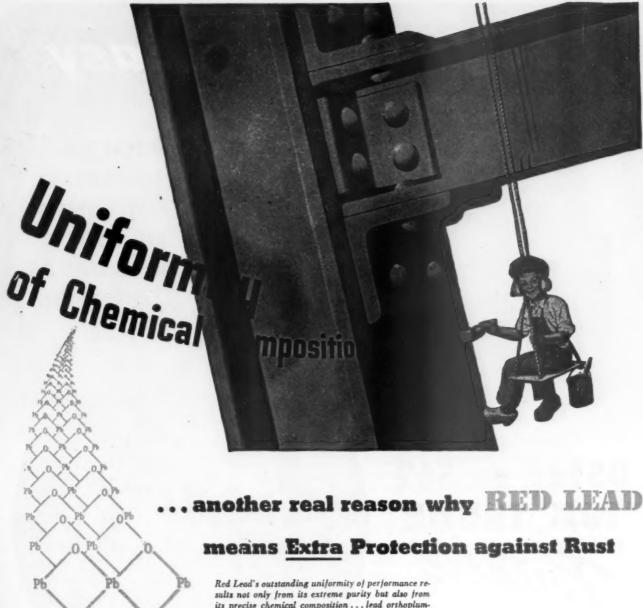












sults not only from its extreme purity but also from its precise chemical composition...lead orthoplumbate. This makes for predictable chemical behavior.

For many years Red Lead has been the standard among metal protective paints because of inherent fundamental properties of the pigment itself.

Among the most important of these is Red Lead's definite chemical composition and uniformity—as distinguished from pigments which have indefinite composition or vary from batch to batch, with resulting possibility of variation in performance.

One reason for this uniformity is that Red Lead is a simple chemical compound, being made from oxygen and high purity metallic lead. Consequently, Red Lead is an extremely pure compound. It contains no corrosion accelerating impurities such as water-soluble salts of chlorides or sulfates.

Uniform composition means dependable performance, day after day, job after job.

Furthermore, Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms

insoluble neutral lead salts at the approximate rate at which the acids are supplied. This is true whether the acids originate from acid forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust inhibiting condition is maintained with a Red Lead paint.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet

4

"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

*

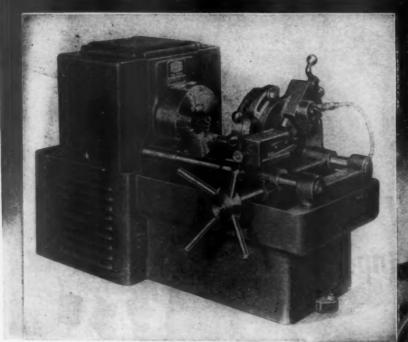


NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cievaland 13, St. Louis 1, San Francisco 10, Beston 6 (National-Boston Lead Ca.); Pittaburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

DUTCH BOY RED LEAD

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Tough Jobs are Easy



SUCH AS
THREADING
BOTH ENDS
OF STOCK
AS SHORT AS
31/2" IN THE
2" SIZE

OSTER NO. 562 "TOM THUMB" Portable THREADING MACHINES

Powerful, extended jaws of the front chuck of this machine grip short lengths of pipe and nipples for quick, easy threading.

Oster No. 562 "TOM THUMB" is equipped with either quick-opening, fixed die-head or with quick-opening, individual, quick-change die-heads and dies, as you prefer.

Ball bearing mounted spindle and worm drive give this machine production speeds that recommend it for many industrial pipe threading jobs as well as for maintenance or construction pipe threading. Standard range ¼" to 2" pipe; extra range ¼" pipe; with drive shaft, the machine has ample power to drive geared die-stocks up to 8" capacity. Bolt range is ¾6" to 1½". Extra bolt range ¼" to ½".

No. 562 "TOM THUMB" is regularly furnished for bench use but where required, it can be mounted on an all-steel wheel stand for easy portability. Catalog sent upon request.



THE OSTER MANUFACTURING COMPANY, 2041 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



PROBLEM: To find a durable cable for oil-immersed, motor-control connections

FIRST SOLVED WITH FLAMENOL CABLE

Eight years ago, a Virginia chemical plant faced a troublesome cable problem. The plant required insulated cable for oil-immersed, motor-control connections. Rubber-insulated cable deteriorated rapidly in the oil, and frequent replacement was necessary.

When this problem was given to the General Electric Company, G-E engineers recommended the use of Flamenol* cable. In a trial installation, Flamenol proved so successful that the customer decided to use it throughout his plant.

If you have a problem of finding insulated cable or wire that will withstand severe conditions, such as contact with oil, Flamenol may very likely be the answer. It has proved its many desirable properties in hundreds of power and lighting applications.

RESISTS FLAME

Flamenol does not support combustion—thus it prevents serious outages due to fires that involve wiring. Requiring no protective braid, it reduces the volume of wiring and eliminates terminating problems due to fraying. Flamenol strips easily and leaves the conductor surface untarnished. It is highly resistant to oils, water, mild acids and alkalis, and weather. It is tough, stable, flexible at low temperatures, and has high dielectric strength.

A G. E. "FIRST"

Only G.E. makes Flamenol wire and cable. Plasticized polyvinyl chloride, the insulation on Flamenol, was pioneered by G.E. and introduced in 1935—not as a "substitute"

GENERAL & ELECTRIC

Buy all the BONDS you can—and keep all you buy

for rubber insulation, but as a new type possessing desirable properties not available in rubber. To find out how Flamenol can help solve your problems—save you time, trouble, and expense—ask our local office, or write General Electric Company, Schenectady 5, N. Y.
*Trade-mark Reg. U.S. Pat. Off.





Pencil drawings on Penciltex provide all of the permanence of the best tracing cloth—all of the permanence plus the additional protection of a moisture resistant surface.

The quality of a Penciltex drawing is best demonstrated by the sharpness and clarity of the prints. Only Penciltex drawings have the contrast so vital for easy-to-read prints.

Let Penciltex guard your P's & Q's the permanence and quality of your engineering drawings.

The Frederick Post Company

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COMPLETE RANGE OF TYPES AND SIZES

FOR PRODUCTION

MAINTENANCE

FORQOMETERS

WHEREVER ACCURATE BOLT TENSION IS REQUIRED

DISTORTION caused by inaccurate tensioning of studs and bolts wastes power, promotes wear and is often the cause of mechanical failure. With Snap-on Torqometers precision tensioning is done more quickly and easily than "guesswork" tightening. Even inexperienced workers pull to specified tension every time . . . they see the torque reading as pressure is applied . . . they work swiftly, confidently, accurately.

The larger sizes of Snap-on Torqometers are widely used in railway maintenance operations. In this photograph Diesel engine crab nuts are being precision tensioned to 1800 foot pounds. The power of three men swing a 2000 ft. lb. Torqometer, length with handle 79 inches.

The full range of Snap-on Torqometers is covered in the 1945 catalog of 3000 Snap-on tools FROM TO 30 INCH for production, assembly, maintenance. Mailed on request. Write, SNAP-ON TOOLS COR-POUNDS PORATION, 8058-J 28th Ave., Kenosha, Wis. UP TO 2000 FOOT POUNDS

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NEER

These and other American railways are users of Ohio Shapers: Atlantic Coast Line, A.T.& S.F., Burlington, Conadian Pacific, Central of N.J., C.& O., C.& N.W., D.& H., Erie, Frisco, Illinois Central, L.& N., Mexico National, Milwaukee, New Haven, N.Y.C., N.& W., Northern Pacific, Pennsylvania, Reading, Southern Pacific, Union Pacific, Wabash, Western Pacific.

OHIO

SUPER-DREADNAUGHT **SHAPERS**

Extension Head and Single Driving Box

Attachment.

Fixture for Shoe and Wedge Fit.

The use of Ohio Shapers for many years by the country's foremost railroads attests their power, capacity, convenience and general adaptability to such severe service. The 36" Ohio Super-Dreadnaught Shaper shown here is unusually well suited to large, troublesome, oversize jobs. Specifications: table — 30"x 48"; ram bearing in column—56"x 1.5"; length of ram without head—80"; long ram allows 36" stroke at any position on table or if work projects beyond front of table; maximum distance from drop table (when furnished) to ram—30"; weight of standard machine—13,400 lbs.

Bulletin No. 80 gives detailed information.

THE OHIO MACHINE TOOL COMPANY KENTON, OHIO

RAILROAD ATTACHMENTS

Complete attachments for railroad shop use are available, including patented extension head with both vertical and circular feed for driving box work, single and double chucks for driving boxes, shoe and wedge chucks in several models, shell brass attachments, main rod brass attachments, fixtures for shoe and wedge fit, transfer gauges, etc.

OHO DREADNAUGHT.
HORIZONTAL BORING, DRILLING AND MILLING MACHINES - SHAPERS - PLANERS

you wouldn't lift a 500 pound load with

It is just as foolish to put carbide cutting tools on an out-moded lathe. Carbide tools have increased horsepower requirements as much as 300 per cent.

Modern Jones & Lamson Lathes are designed specifically to carry this extra load, and more. They have the power, they have the rigidity, they are easy to operate.

Now is the time to check your equipment. Plan now to scrap obsolete machines and replace them with good War Surplus machines or new machines. Our engineers will be glad to assist you.





What HORSEPOWER Are You Using?

This cut, on 2-inch bar stock, requires 300 per cent more horsepower with a carbide tipped tool than with a high speed steel tool, and Carbide halves the cutting time.



Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools



JONES & LAMSON

MACHINE COMPANY Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes · Fay Automotic

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



If someone told you that your chipping hammers were operating at only 60% cutting efficiency, you wouldn't believe them. Yet it has been found that even good operators cannot be relied upon to find 20% or less difference in the cutting ability of a group of hammers. That difference must be found by measuring the actual metal removed.

Recently a large plant asked our "cutting efficiency service" engineers to check their hammers. Tests soon showed that most of them were in very poor operating condition, so all types were shipped to our factory for a standard comparison cutting test against master hammers. Reports showed that they varied from 40% to 70% low in C. E. and were 6% high in air consumption.

From the tests it was obvious that the continued use of these hammers would cost thousands of dollars. Those beyond economical repair were replaced with I-R Flapper-Valve hammers and the balance were repaired as outlined by our service engineers. Production costs were reduced and more chipping per operator resulted.

An I-R service engineer will be glad to show you how to maintain the highest cutting efficiency for your hammers. A copy of our handy two-color Chipper Repair Wall Chart is yours for the asking.



Ingersoll-Rand

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is the RIGHT way!

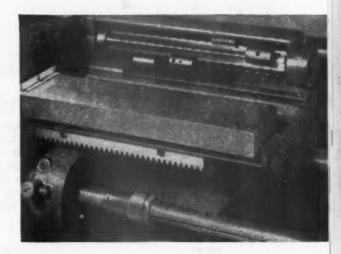
There is no substitute for *bard* steel on the ways of a turret lathe. That's why Gisholt does it *right*... makes its bedways of steel, hardened to 64-66 on the Rockwell C scale.

That's why Gisholt's ways can't be battered by heavy work or scored by hard, tough chips. Straddle-keyed their entire length, bolted to bedways from the under side, and finish-ground in exact alignment with the spindle, Gisholt's hardened-steel ways provide bearing surfaces that are virtually wear-proof. They insure the high standard of accuracy for which Gisholt is known—and maintain it through long years of service.

GISHOLT MACHINE COMPANY

1293 East Washington Ave. • Madison 3, Wisconsi

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning





Gisholt's thick, block-type ways are bardened on all surfaces: (1) top to support weight of carriages and cutting pressure of tools, (2) both sides for alignment and gibbing, and (3) for bottom gibs and clamps. Automatic pressure lubrication eliminates any tendency to wear, even in areas of beaviest carriage travel.

LES Latties



FOR PRECISION and LOW COST PRODUCTION

THE above illustration shows one of the most recent railroad shop installations of an 18" Lodge and Shipley engine lathe. This L & S Lathe, like the entire line of L & S Lathes, is noted for its superior production and precision features. Here the lathe is shown machining a valve stem 623/4" long, turning the valve crosshead fit. Only one of many jobs which keep this lathe busy.

L&S Lathes are making a "Big Hit" as "Big Producers" because every detail from the bed to the tool post is designed to turn out a maximum output with minimum effort. L&S outstanding features are many and include centralized control, automatic oiling, ample power, rigid mounting, sustained accuracy, simplicity and sturdiness in the gear box. Sizes range from 12" to 27".



CINCINNATI, 25. OHIO. U.S.A.

Lathe D



NEW MEKAY

MILD STEEL ELECTRODES

To an already unusually complete line McKay has added two new mild steel, shielded-arc welding electrodes with characteristics suited to modern welding needs. With these additions, the McKay researched line now offers a wider range of standard mild steel electrodes than ever before!

From this variety it is possible to select a "stock" rod that will fill most any specific need, without delay or premium cost for specials.

OTHER McKAY MILD STEEL ELECTRODES

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WELDING ELECTRODES ... COMMERCIAL CHAINS ... TIRE CHAINS

N

A 40-day job of car washing ... Done in a single day



WHITING CAR WASHERS SAVE TIME AND LABOR, MATERIALLY REDUCE WASHING COSTS

Whiting Washers mean considerable savings in car washing time, labor, and costs; typical example of their effectiveness is this installation in an Eastern railroad yard. Here a crew of 10 cleans 250 cars per working day by means of Whiting Washers—though the same job, done by hand, takes them 40 days. Washing costs are approximately 20 cents per car with Whiting Washers.

Write for information.

15609 Lathrop Avenue, Harvey, Illinois

RAILROAD MAINTENANCE EQUIPMENT

DROP PIT TABLES = LOCOMOTIVE HOISTS + HIGH-LIFT JACKS + LOCOMOTIVE SPOTTERS CAR WASHERS = CINDER CONVEYORS + TRANSFER TABLES + CROSSOVER BRIDGES

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.

RECTOX BATTERY

FOR A FULL-CHARGE IN THE YARD OR A BOOSTER-CHARGE ON A SHORT "LAYOVER"

1019



RECTOX Offers All These Advantages

ADAPTABLE—Automatic or nonautomatic types available; for either Diesel locomotives or passenger car batteries.

ROLLS FROM CAR TO CAR—Its narrow width permits use between adjoining tracks. Low center of gravity minimizes danger of tipping. Has parking brake.

DEPENDABLE AND "TROUBLE-FREE"—over an unlimited life, with low maintenance.

ECONOMICAL—High charging efficiency, particularly on 50% to 75% load, lowers power costs.

\$AFE—Thermal-overload protection; battery circuit fused.



A RECTOX COPPER OXIDE DISC

The Rectox plate assembly is composed of a series of large copper oxide plates, $4\frac{3}{8}$ " x 12" assembled on an insulated bolt. Rectox Rectifiers, installed more than 16 years ago, continue to give dependable operation.

Diesel locomotive and passenger car storage batteries have to operate continuously, under all conditions of weather and tough service. In a great many instances, charging of these batteries has necessarily been "catch as catch can".

Mobile Westinghouse Rectox Railway Battery Chargers are "made to order" for such a situation. As car or locomotive rolls to a stop, the Rectox charger is rolled up—is plugged into the 230-volt, 3-phase, 60-cycle, a-c outlet, also plugged into the battery . . . the selector and tap switches set, and the battery is immediately "on charge".

Car or locomotive standing time becomes Rectox charging time—from short boost to full seven to eight-hour charge.

The nonautomatic type is for manual control, boost charging.

The automatic type has a temperature compensated voltage relay for two-rate charging of lead-acid batteries. Nickel-Alkaline batteries are charged by the modified constant current system. An adjustable time switch automatically terminates the charge.

Another invaluable Westinghouse contribution to modern railroading, Rectox is timesaving, battery-saving and moneysaving. For complete information call your nearest Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21354



Westinghouse
PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

Lector

RAILWAY BATTERY CHARGERS



There are scores of applications . . . on any train . . . in any yard!

TYCAR synthetic rubber is one new material that will help modernize tomorrow's freight and passenger trains. Hycar will result in improved hose, gaskets, seals, bushings, vibration dampeners, mountings, electric cable sheathing, or dozens of other applications. There are hundreds of places where HYCAR's properties—listed in the box at the right (and available in any number of specifically selected combinations)-can mean money saved because parts made from HYCAR are more dependable, last longer, greatly reduce maintenance expense.

Wherever a resilient rubber part is exposed to oil or grease, extreme temperatures, severe abrasion and

wear, sunlight, and other destructive factors—and where the part must stay resilient under compression loads -that part should be made from HYCAR synthetic rubber.

We make no finished rubber parts from HYCAR. We supply the crude rubber as raw material to companies which make it into finished rubber products. So ask your supplier for parts made from HYCAR for test in your own applications—severe or routine. Learn for yourself that it's wise to use HYCAR for dependable, longtime performance. For help with product development or for information on procurement of HYCAR parts write Hycar Chemical Company, Akron 8, Obio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

- EXTREME OIL RESISTANCE—lasuring dimensional stability of parts.
 HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. lat oil.
- 3. ABRASION RESISTANCE-50% greater than 4. MINIMUM COLD FLOW—even at elevated
- 5. LOW TEMPERATURE FLEXIBILITY down to —65° F.
- -65°F.

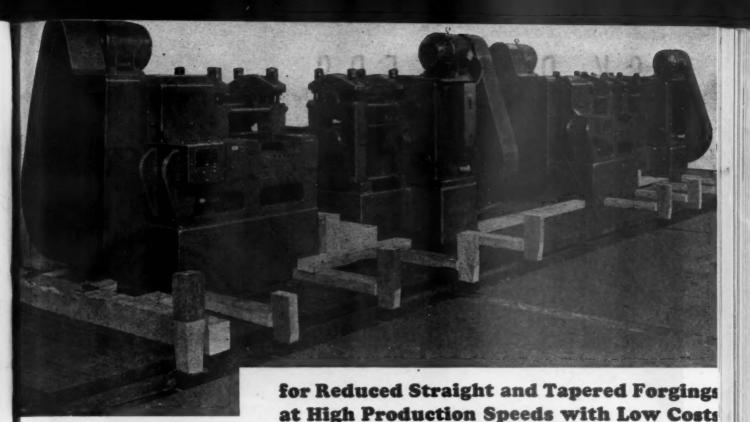
 6. LIGHT WEIGHT-15% to 25% lighter the many other synthetic rubbers.

 7. AGE RESISTANCE—exceptionally resistant checking or cracking from axidation.

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 toct under pressure. (Metal adh
 could adhered.)

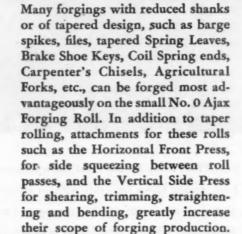


Synthetic Rubbers



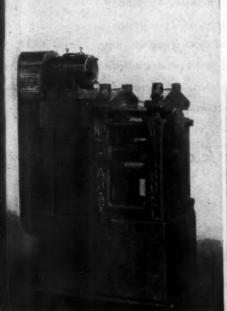
AJAX WIDE ADJUSTMENT

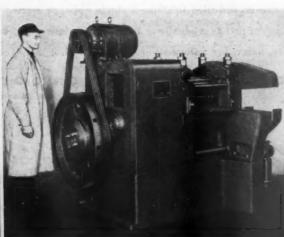
FORGING ROLLS



With the six larger sizes of Ajax Forging Rolls the entire field of gay rolling which can be handled manu ally is covered and such parts a: automobile rear axle drive shafts automobile gear shift levers, auto mobile brake pedal levers, railroad car brake levers, tapered tubing and many others can be forged quickly and efficiently. And the simplicity with which these rolls effect grea reductions in cross sectional area makes them most valuable in blank ing stock to desired sections for sub sequent upsetting, press forging o drop forging.

Write for Catalog No. 91-A







THE AJA MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

312 WESTMINSTER BUILDING OF CHICAGO 2 HUNGIS

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ASK RIVETERS... they'll tell you "Thory hammers FEEL right!"



EXPERIENCED RIVETERS know by the "feel" of a hammer when it starts whether or not it will hit hard, steady blows smoothly without excessive vibration. They find in Thor Riveting Hammers the "right touch"—because of a number of Thor design and construction advantages. Positive throttle control is just one of these Thor advantages—accomplished by main valve action that is so sensitive and perfectly controlled that the tool can be throttled to strike a single blow, or started slowly and increased in speed and power just as gradually as the operator desires . . . without jerks or "kickbacks." Write today for information about all Thor Air Tools in Catalog 52-B.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 West Jackson Boulevard, Chicago 6, Illinois

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PREUMATIC TOOLS . UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS . MINING AND CONTRACTORS TOOLS

Now-a silicone varnish that cures at 300°F

SILICONES VARNISH

Dow Corning 996 is an electrical impregnating varnish for low temperature baking.

Dow Corning 996 was developed to provide manufacturers of new equipment and rewinders of old equipment with a heat resistant, waterproof silicone varnish which can be cured at temperatures obtainable in ovens now used for curing organic insulating varnishes.

Dow Corning 996 is used as the dipping or impregnating varnish for equipment wound with typical silicone insulation components. These include Fiberglas cloth, tape and sleeving varnished with ID 993; silicone bonded mica-Fiberglas for ground insulation; silicone bonded Fiberglas served magnet wire; silicone-Fiberglas laminated coil separators and slot sticks, and Silastic* coated lead wire.

Electrical equipment, wound with silicone insulating components and sealed by impregnating with ID 996, will have the high order of thermal stability and retention of water-proofness characteristic of silicone insulation.

Dow Corning 996 thus enables all types of electrical shops to realize the advantages of silicone insulation. It is recommended for use in equipment which is to be operated at temperatures up to 175°C. (347°F.). For higher operating temperatures, or extremely severe service conditions, ID 993 should be used throughout. The same methods of dipping, spraying, or vacuum-pressure impregnating that are used for applying conventional organic varnishes can be used with ID 996.

PROPERTIES—Dow Corning 996 is furnished as a 50 per cent by weight solution in an aromatic solvent and has a viscosity of 2 to 5 poises. In this consistency DC 996 is suitable for impregnating electrical equipment. It can be reduced to any desired viscosity with aromatic naphtha.

Dow Corning 996, when coated on metal, air dries to a slightly tacky, soft film. Baking the coated panel at 150°C. (302°F.) for a period of four hours will cure the coating to a non-flowing, tack-free, flexible film. DC 996 has ample heat stability for continuous use at temperatures as high as 175°C. or for intermittent use at higher temperatures.

ELECTRICAL PROPERTIES OF ID 996—(measured on coated panels at 25°C, and 50% relative humidity.)

Dielectric	Strength, vo	lts per	mil			. 1	15	00	to	2000
Dielectric	Constant, at	1000	cycles.	0 0						3.0
Power Fa	ctor. at 1000	cycle	8							0.7%

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MIDLAND, MICHIGAN

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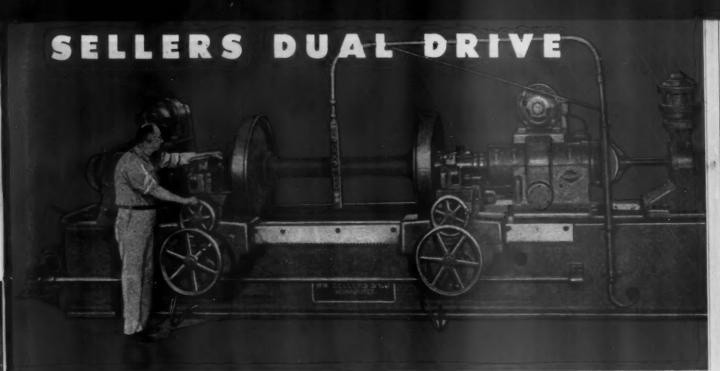


The commonly used chromium-Nickel type stainless steel that lines this fractionating column possesses natural immunity to rust and corrosion under virtually all oxidizing-acid conditions. Its resistance to creep, scale or oxidation at high temperatures assures long economical operation. Built by A. O. Smith

Corporation, Milwaukee, this column, including the top section, exceeds 125' in length.

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axle lathe is designed to meet production demands and accuracy standards by the use of carbide tooling. It's a heavy, rugged machine for turning inside and outside journals on mounted wheel sets, also journals and wheel seats on loose axles.





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- Dual end drive with friction plates against each end of axle.
- 2 Drive is by dual motors through worms and worm wheels.
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- Generating tool holder for turning true fillets without chatter.
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- 7 Finger-tip feed selection in either direction by electronic control.
- 8 Centers are safety locked by power.
- 9 Hardened wear plates on bed.
- 10 Solid bed continuous way construction—arranged for coolant system.

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Stop wishing-such fastenings are here!

They are Waldes TRUARC Retaining Rings, made of long-lasting, hard-wearing "K" Monel.*

Weight-saving, time-saving advantages have already won wide use for TRUARC Rings. But now that they're available in "K" Monel, their usefulness is extended to applications where special mechanical requirements - or corrosive influences - formerly forbade their use.

The immunity of "K" Monel to corrosive attack (plus its galvanic compatibility with bronze parts) makes these rings particularly suited for certain types of railway equipment.

Because they can be heat treated, TRUARC Rings made of "K" Monel possess strength and hardness comparable to that of heattreated alloy steel.

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To the manufacturer, use of these rings (wherever practicable) means reduced machining and assembly costs. And, to the railroader, they mean easy disassembly, unhampered by corroded surfaces-because "K" Monel resists corrosion! The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

*Reg. U. B. Pat. Off.



What are Waldes TRUARC' Rings?

In many industries, especially the aircraft, TRUARC Retaining Rings are used to lock, secure ar position moving parts, be they shedts, gears, bushings or bearings.

They are available as internal rings for fitting into grooved housings or as external rings for fitting around grooved shafts or pins in sizes up to 10"

Their use safely saves weight, space and machining costs, while simplifying assembly and disassembly.
Two outstanding features make these rings superior to ordinary spring retainers:

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- A leading manufacturer uses TRUARC Retaining Rings wherever possible:
 - ... as retainers in place of shoulders, nuts and threaded collars

 - ... to position bearings, bushings, shafts and pins ... to take high axial loads in place of shoulders ... to save weight, assembly time and machining

For more information on TRUARC Rings and how they n be used, write the manufacturer: Waldes Koh-I-Noor, Inc., Long Island City 1, New York.

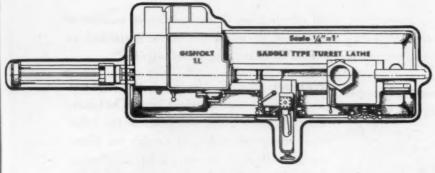
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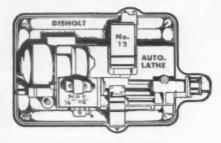
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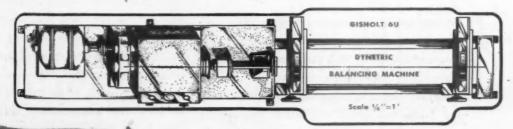
Gisholt is ready to assist with cardboard punchings for each size and type of Gisholt machine. These models—each made to exact scale—enable you to plan the location, or re-location, of machines by simply placing them upon your projected factory floor layout sheets to obtain the most efficient arrangement of machines, more easily. They are available, free of charge, upon request, to all companies preparing for reconversion to peacetime production. Use the coupon below.



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- __ 3L Saddle Type Turret Lathe
- __ 4L Saddle Type Turret Lathe
- __ 5L Saddle Type Turret Lathe
- __ 15 Dynetric Balancing Machine __ 35 Dynetr c Balancing Machine
- __ 3U Dynetric Balancing Machine

__ Simplimatic (Automatic) Lathe

- __ 4½U Dynetric Balancing Machine
- __ 6U Dynetric Balancing Machine
- _ Dynetric Micro-Balancer

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THE EDITOR'S DESK

ECONOMIC ILLITERACY

Much intelligent and constructive planning has been done throughout the nation to insure a successful transition from a wartime to a peacetime economy. This can be done, however, only by unselfish co-operation in the common interest, on the part of all our people. No one group or interest should expect to profit unduly at the expense of the people or nation as a whole.

We face a difficult task. We must pay for a world war, with its stupendous wastes and destruction. We cannot sidestep the fact that we must all make reasonable sacrifices toward that end to insure prosperity and the stability of national and international relations.

Because people are unwilling to face these cold facts; because we seem not to have learned that co-operation, rather than force, must be used in dealing with one another, reconversion in some important places is being sadly interfered with and production which will insure employment and prosperity is being blocked—blocked by economic illiterates who seem determined to bite off their noses to spite their faces.

Here is what Lewis B. Schwellenbach, Secretary of Labor, said in a radio broadcast on Labor Day: "But we cannot have full employment unless we have 'full production' of goods and services, and we cannot have full production unless we have full consumption. And we will have none of these—full employment, full production, or

full consumption—if our productive machine is stalled and our power to consume diminished, as a result of chaotic industrial relations."

Word came from Washington, as this page was being prepared, that President Truman had drastically reorganized and strengthened the Labor Department, thus making it possible for Secretary Schwellenbach to exert a larger influence in the adjustment and settlement of labor difficulties.

The Secretary is reported to have said: "My first task is to rebuild the United States Conciliation Service." This is encouraging, for if the department achieves the status established by its former director, Dr. John Roy Steelman, it can be an important factor in bringing about a better understanding by management and labor of those principles of economics which must be observed if a square deal is to be assured the public, the workers, the management, and the investors. Only by so doing can real stabilization of employment and prosperity be attained—and Secretary Schwellenbach's Labor Day statement indicates an appreciation of that fact.

Roy V. Wright



of King Boring Mill is turning 28" trailer tires using one of the latest types of cutting tools. Machine operators and shop foremen are very enthusiastic about the exceptional production record of this machine. The rough feed is 1/10" and the finishing feed 1/64" with a cutting speed of 225 feet per minute.

All King machines are engineered throughout to conform with the most recent machine shop practices. Their ability to stand up with unyielding rigidity is unsurpassed even under the heaviest cuts and speeds made possible by the use of the most modern cutting fools.

Single column machines, 30", 36" and 42" swing. Double column machines, from 52" to 144" swing. All available with or without side head.

The KING MACHINE TOOL Company

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY CINCINNATI, OHIO

Joe. look at Dearborn ad on Page 12 of Railway Mechanical Engineer (August Issue) HOW ACCURATE ARE OUR COSTS ON WATER TREATMENT? REPORT ment Service RBORN.

But many executives are checking costs now for peacetime operation



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		Southern's First Diesel Instruction Car Characteristics of Car Journal Oil
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Sharpening a large taper reamer on a CINCINNATI No. 2 Cutter and Tool Grinder Sharpening a pencil sharpener cutter on a CINCINNATI No. 2 Cutter and Tool Grinder



CINCINNATI No. 2 Cutter and Tool Grinder. A brief description of this machine may be found in Sweet's Catalog File. For complete specifications, write for Catalog M-962-3.

If you use a variety of cutters in your shop, there is no better machine to sharpen them correctly than the CINCINNATI No. 2 Cutter and Tool Grinder. This machine has many features, and extra attachments, too, for sharpening an exceptionally wide variety of cutters. Two extremes are shown on the opposite page; the larger taper reamer demands ruggedness; the small pencil sharpener cutter requires sensitive table traverse. Other features provide the flexibility required for sharpening face mills, slab mills, interlocking cutters, shell end mills, taps, planer and shaper tools, and others. I Write for complete information on this versatile cutter and tool grinder. And if you would like a few hints on the correct sharpening of cutters, ask for bulletins M-1296 and M-1377.

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THE CINCINNATI MILLING MACHINE CO.

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MILLING MACHINES

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New York Central Develops

High-Capacity 4-8-4 Locomotive

LOCOMOTIVE No. 6000, delivered by the American Locomotive Company to the New York Central early this spring, is a major step forward in the progress of the New York Central's equipment engineering department in steam locomotive development during the past twenty years. The Class J-1 4-6-4 type, was introduced in 1927. This was followed by the Class J-3 ten years later. Then came refinements in the Class L 4-8-2 freight locomotives which have adapted those more recently built to high-speed passenger service as well as to freight service. The Class L-4 locomotives, the most recently built of the type, were first delivered in 1942.

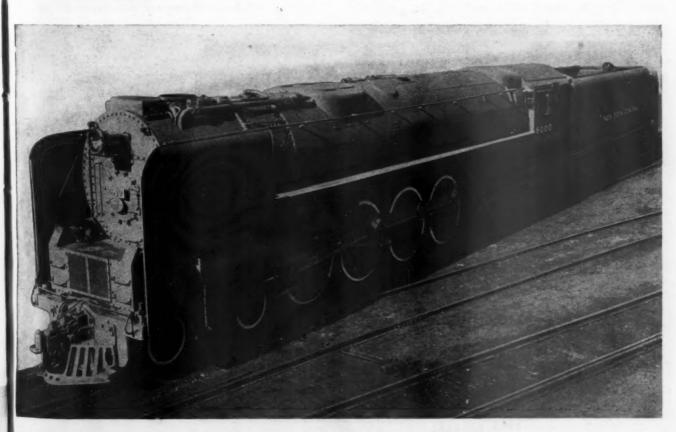
The development of the Class S-la locomotive, known locally as the Niagara type, began with the intention of bringing out a new class of L type locomotives with some expansion of boiler capacity. As the development progressed, however, it became evident that to attain the full possibilities of increased boiler capacity a 4-8-4 type wheel arrangement was required. The Class S 4-8-4 locomotive is expected to develop not less than 6,000 i. hp. This compares with a maximum indicated horse-

Large boiler built without a dome has 100 sq. ft. of grate and 6,600 sq. ft. of combined heating surface — Complete Timken rod installation—The tender carries 46 tons of coal

power of nearly 4,800 for the Class J-3 4-6-4 locomotive and 5,400 for the Class L-4 4-8-2 type.

The Boiler

The boiler has been increased both in diameter and length from that of the Class L-4 locomotive. The outside diameter of the third course is 100 in. and the top of the boiler is practically at the clearance limit, which



Railway Mechanical Engineer OCTOBER, 1945

Table I—General Dimensions, Weights and Proportions of the New York Central 4-8-4, Class S-1a Locomotive

Road class	S-1a
Road number	6000
Date built	March, 194
Steam pressure, lb, per sq, in,	275*
Drivers, diameter, in.	75*
Cylinders, number, diameter and stroke, in.	2-25 x 32
	62.330*
Rated tractive force engine, lb.	Baker
Valve gear, type	
Valves, piston, diameter, in	14
Maximum travel, in	81/2
Steam lap, in	19/10
Exhaust clearance, in.	8/16
Lead, in	5/36
Cut-off in full gear, per cent	83
Dimensions:	
Height, rail to top of stack, ftin,	15-134
Height, rail to center of boiler, ftin.	10-71/2
Width overall, ftin.	10-73/2
Cylinder centers, in.	92
Wheel bases, ftin.:	74
Driving	20-6
	13—8
Rigid	
Engine, total	48-9
Engine and tender, total	97-21/2
Weights, Ib.:	
Front truck	91,000
Drivers	275,000
Trailing truck:	
Front	48,000
Rear	57,000
Engine, total	471,000
Tender (8/s loaded)	337,400
Weight on drivers, per cent weight of engine	58.39
Weight on drivers + tractive force	4.41
Tender:	4.41
Type	Red ·
Water capacity, gal	18,000
Coal capacity, tons	46
Wheel arrangement	4-10-0

^{*}These dimensions apply to the locomotive as delivered by the builder with 75-in, driving wheels. When these wheels are replaced with the 79-in, set the working boiler pressure will be increased to 290 lb. per sq. in, and the rated tractive force will be 62,400 lb.

precludes the employment of a steam dome. Grate area has been increased from 75,3 sq. ft. to 100 sq. ft. and the depth of the combustion chamber from 63 to 92½ in. The length of the tubes has been reduced from 20 ft. 6 in. to 19 ft. The boiler has been designed for a maximum working pressure of 290 lb. which is required with the 79-in. driving wheels.

In lieu of a dome, from which to collect steam, the steam dry pipe, closed at the rear end, has a series of 28 1-in. transverse slots across the top, each with a clear chord length of 5 in. The dry pipe, 11 in. in inside diameter, has an internal cross-sectional area of 95 sq. in. The steam gathering area through the slots is 140 sq. in.

Baffle plates which extend out below these openings on each side of the steam pipe have proved effective in preventing moisture carryover. These are 50 in. in length and are welded at the ends to vertical end plates which fit over the steam pipe and extend up close to the inside of the boiler shell at the top.

The shell courses of the boiler are carbon-silicon steel. This material is estimated to have permitted a reduction in weight of about 7,000 lb. as compared with carbon steel. Construction details follow closely the boiler of the L-4 class. The inside firebox is welded throughout. The circumstantial wrapper and outside throat-sheet seams and the butt joints of shell courses at ends of longitudinal seams are seal welded. The usual seal welding has been made in the vertical seams of the outside firebox.

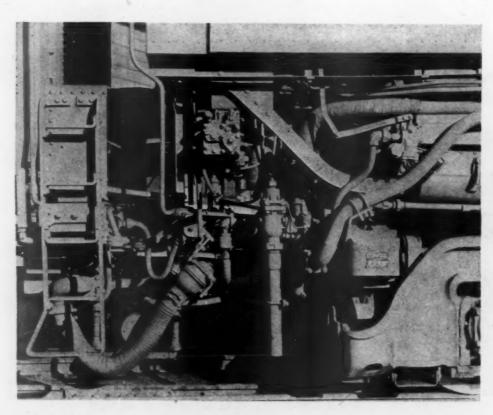
The American arch is carried on five 4-in. arch tubes. Coal is fired by a Standard HT stoker with the engine on the tender. The grates are Firebar. The feedwater equipment consists of the Worthington No. 7SA feedwater heater and a Nathan No. 4000 injector on the right side. A Barco low-water alarm is applied.

One of the bottlenecks in the maintenance of uninterrupted road service of steam locomotives in modern, fast long-distance train movement is limited ash-pan capacity. The ash pan on the S-la locomotive has a volume of 86 cu. ft. with four hoppers. That on the L-4a was limited to 50 cu. ft. The ash-pan volume, in cubic feet per square foot of grate area, is .86 on the S-la, .66 on the L-4a and .76 on the J-3a locomotives. The body of the pan is of welded construction and the hoppers are cast steel.

The front ends are the railroad's Selkirk type similar to those on the Class L-4 locomotives.

Running Gear

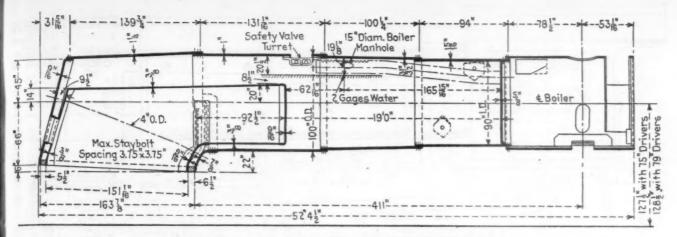
The foundation of the locomotive is a cast-steel engine bed which includes the locomotive cylinders with integral



The injector, No. 8-A air-brake distributing valve, and blow-off cock with cylindrical muffler (the end appears behind the injector suction hose) below the right side of the cab

SFTSCGETTTT with 19-in and

the fire and hou dev



Sectional elevation of the boiler of the New York Central Class S-1a locomotive

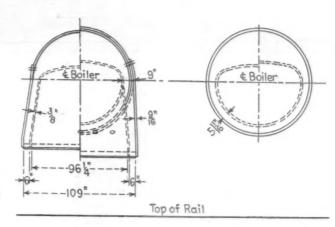
Table II-General Dimensions and Proportions of the Boiler

Steam pressure, lb.	275*
Diameter first ring, inside, in	.90
Diameter third ring, outside, in.	100
Sheet thickness, in,:	
Smokebox	34
First ring	18/10
Second ring	81/80
Third ring	1
Back head	9/10
Side sheets	9/16
Roof sheet	154
Furnace door sheet	34
Furnace side sheets	32
Furnace crown sheet	14
Combustion chamber	12
Front tube sheet	12
Back tube sheet	6/18
Firebox length, in.	1511/10
Firebox width, in.	961/4
Water space, front, in.	61/2
Water space, back, in.	51/2
Water space, sides, in.	6
Combustion chamber length in	921/2
Combustion chamber length, in.	
Arch tubes, number and diameter, in. Flues, number and diameter, in.	5—4 177—4
Fluce thickness in	
Flues, thickness, in.	No. 9 BWG
Tubes, number and diameter, in. Tubes, thickness, in.	55-2¼
Length core tube cheets (4 in	No. 11 BW
Length over tube sheets, ftin. Net gas area through tubes and flues, sq. ft.	19-0
Net gas area through tubes and nues, sq. it.	10.57
Superheater, type	E.
Fuel	
Grate area, eq. ft.	100
Feedwater heater, type	Worthington
Heating surfaces, sq. ft.:	440
Firebox and comb. chamber	460
Arch tubes	57
Firebox, total	517
Tubes and flues	4,115
Evaporative, total	4,832
Superheater Combined evaporative and superheater	1,977
	6,609
Boiler proportions:	2.00
Firebox heating surface per cent comb. heating surface	7.82
Tube-flue, heating surface pre cent comb. heating surface	62.26
Superheat surface per cent comb. heating surface	29.91
Firebox heating surface + grate area	5.17
Tube-flue heating surface + grate area	41.15
Superheat surface + grate area	19.77
Combined heating surface - grate area	66.09
Gas area, tubes-flues grate area	0.1057
Evaporative heating surface + grate area	46.32
Tractive force + grate area	623
Tractive force + evap, heating surface	13.46
Tractive force + comb. heating surface	9.43
Tractive force × dia, drivers + comb, heating surface	707.5

^{*}These dimensions apply to the locomotive as delivered by the builder with 75-in, driving wheels. When these wheels are replaced with the 19-in, set, the working boiler pressure will be increased to 290 lb. per sq. in and the rated tractive force will be 62,400 lb.

back cylinder heads, the air-pump brackets, and the main reservoirs. The boiler is supported by sliding shoes at the second course and at the front and rear ends of the firebox.

The driving wheels are mounted on hollow-bored axles and the roller-bearing assemblies are of the Timken splithousing type with two-roll bearings. Also lateral motion devices are applied on the front and intermediate pairs of driving wheels. They permit a controlled lateral of 1/8 in. and 1/16 in. per side, respectively.



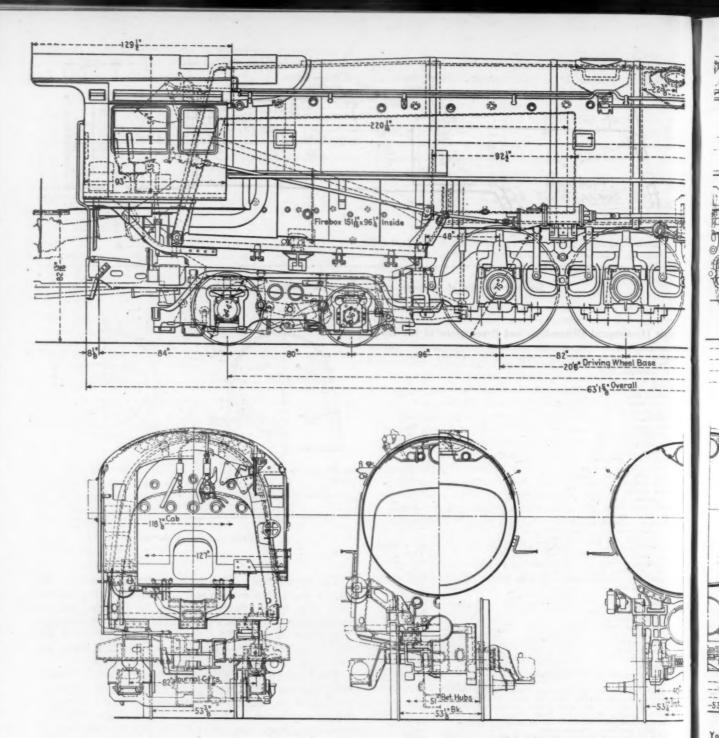
Cross-sections of the boiler

The engine truck has a roller centering device for the bolster and a combination coil and elliptic spring suspension. The truck wheels are 36 in. in diameter and the inside journals are fitted with Timken roller bearings. The front wheels of the four-wheel trailing truck are 36 in. and the rear 44 in. in diameter. These axles are fitted with outside Timken roller-bearing boxes.

The locomotive is driven by a complete set of Timken roller-bearing rods. These include bearings on the crosshead wrist pin and the four crank pins. The roller bearings are mounted on the crank pins and the rods with spun-brass liners are slipped over the outside bearing races. A single rod on each side leads from the main to the front driving wheels; in order, outside of this on the main pin, are a main-to-intermediate side rod, the main rod back end, and another main-to-intermediate side rod. Between the ends of the two main-to-intermediate rods on the intermediate pin is the front end of the back side rod.

The one-piece pistons are of electric cast steel designed for the railroad's lip-type packing rings. The hollow piston rod is of Timken alloy steel with the Timken type of crosshead connection. The crosshead shoe is of aluminum. The guides are not attached to the rear cylinder heads.

In counterbalancing the locomotive only the main driving wheels are cross-balanced. The total revolving weights on each side of the locomotive amount to 3,064 lb. and the reciprocating weights to 1,547 lb., of which 25 per cent is balanced. This requires an average overbalance per wheel of about 97 lb. and leaves a recipro-



Cross-sections and elevation of the New

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cating unbalance per ton of total engine weight of 4.94 lb.

The reciprocating parts and crank pins, with the exception of the front, are chrome-nickel-molybdenum steel. The main and side rods are manganese-vanadium, and the locomotive axles carbon-vanadium steel. The crank pins in the front drivers are of carbon steel.

Loop type hangers are used in the driving and trailer spring rigging of this locomotive. Coil springs are inserted in the hangers at the engine-bed connections in from of the No. 1 driving wheels and at the connection to the trailer frame back of the rear trailing-truck axle.

Steam Distribution System

The 14-in. distribution valves are driven by the Baker valve gear, with needle bearings. This gear provides a maximum travel of 8½ in. The valve motion is controlled

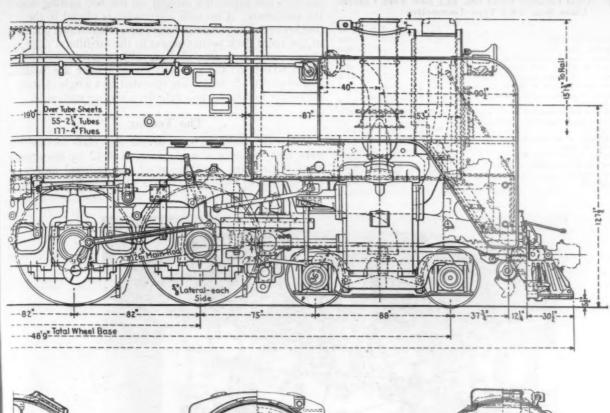
by the Franklin Precision reverse gear which is attached to a bracket on the engine bed and not to the boiler. The Hunt-Spiller lightweight valves are fitted with bronze Duplex lip valve rings.

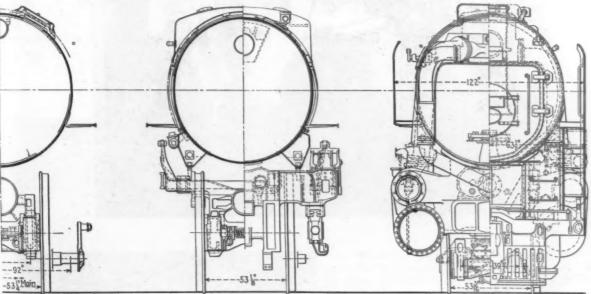
The larger boiler diameter permitted better superheater proportions. Particular attention was given throughout the steam passages from the boiler to the exhaust to bring the pressure drop to the minimum.

The minimum area through the superheater tubes is 86.6 sq. in. This compares with 70.5 sq. in. on the L-4 class. In the table is shown a comparison of the crosssectional areas of the chain of steam passages.

Lubrication

One Nathan DV-8 42-pint lubricator is applied on the right side of the locomotive. From this lubricator are





York Central Class S-1a locomotive

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two feeds to the steam pipes, two feeds to the cylinders, one feed, with a four-way distributor, to the guides, and one feed to the stoker engine.

The chassis lubrication is by Alemite and Rex oil fittings. Alemite soft-grease fittings are used on the valve gear, including the Valve Pilot fittings, on the radial buffer, on the valve-stem crossheads, on the water-scoop piston rod, and on the lateral-motion-device spring seats. Alemite fitttings using valve oil are applied on the driving-box pedestal faces. Rex oil fittings are installed for engine-truck-box, trailer-truck-box, and tender-truck-box pedestals, and on the crank pins and roller-bearing wrist pins. The power reverse-gear cylinder is lubricated by a Norgren No. 401-4 lubricator with Alemite soft-grease fittings on the reverse-shaft bearings and the reach-rod connection.

Alemite hard grease fittings are applied on the back ends of the eccentric rods.

Engine oil is used to lubricate the firebox expansionshoe castings, engine-truck and tender-truck center plates, and miscellaneous points.

Spring-rigging pin and loop connections are lubricated with Alemite soft-grease fittings.

Cab and Cab Fittings

The cab is built of aluminum plates throughout and is entirely supported on the boiler by cantilever beams. Aluminum is also used for such parts as running boards, front platform and air-pump shield, the smoke-lifting shields at the sides of the front end, casings, gauge boards, etc.

Two saturated-steam turrets are mounted on the boiler

Table III—Steam Passage Areas (Sq. In.) New York Central Class S-1a 4-8-4 Type Locomotive

	J-3	L-3-L-4	S-1a
Internal area of dry pipes	56.7	69.0	95.0
Area of dry-pipe slots			140.0
Minimum area through superheater tubes	61.8 -	70.5	86.6
Area past throttle valves, wide open		73.6	98.4
Internal area of one steam pipe	50.2	56.7	63.6
Port area one valve bushing at 50 per cent cut-off	30.1	29.2	30.5
Minimum area of passage, one end of cylinder			
to valve bushing	42.9	51.8	53.2
Port area of one valve bushing	76.3	79.6	90.4
Exhaust port area of one valve bushing at end		10.0	***
of piston stroke	70.0	69.3	70.9
Available exhaust area around valve bushing,		54.0	F = 0
end of piston stroke	50.0	56.0	57.0
Exhaust area at end of valve bushing	76.0	73.1	75.0
Exhaust area one side of exhaust stand	52.0	52.0	62.0
Area exhaust nozzle	38.5	39.9	44.2
Area one cylinder	397.6	530.9	490.9

pressors are supported directly on the bed casting under the smokebox. A fin-tube aftercooler is placed in the air line between the two main reservoirs. Removable portions of the front deck permit access to the air-filters. The air compressors are built with integral lubricators.

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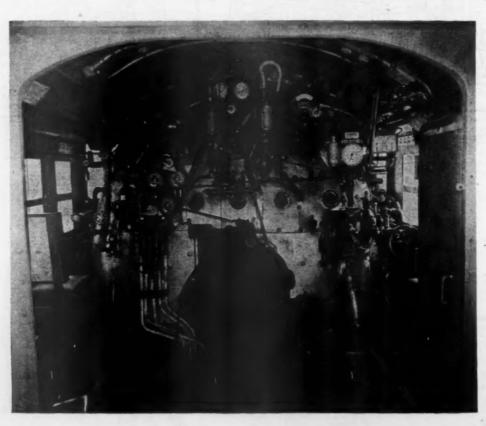
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All wheels on the locomotive and tender are braked. The engine-truck brakes are operated by a single cylinder; the driver brakes, by two cylinders, one on each side.

The Tender

When the characteristics of the S-1 class locomotive were first receiving consideration in 1942 by the equipment engineering department of the railroad authority was secured to build five tenders of the bed type carried



just ahead of the cab, one on the right and the other on the left side. The right-hand turret provides connections for the cab radiator, the smoke consumer, the coal pusher, the headlight generator, and the injector. From the left turret steam is taken for the steam-heat reducing valve, the stoker, the feedwater pump, and the coal sprinkler. Superheated steam is furnished for the blower and the locomotive whistle. The whistle is mounted beside the stack on the smokebox.

The headlight generator is placed back of the rear driver on the right side of the locomotive. The exhaust is piped to the ash pan.

The locomotives are equipped with a Vapor $2\frac{1}{2}$ -in. steam-heat reducing valve. The sand-box arrangement is unusual. On top of the boiler is an aluminum sand box of limited capacity from which two rectangular tubes extend down the sides of the boiler under the jacket to right and left steel boxes located under the running boards. The New York Air Brake sand traps at the lower ends of these sand boxes distribute sand in front of the front and main drivers.

The air brakes are the New York Schedule 8ET with relay valve. The two 8½-in. cross-compound air com-



The backhead of the boiler in the erecting shop

on one four-wheel leading truck and five pairs of wheels mounted in pedestals on the tender-bed casting. The objective of this design was to provide approximately the same coal and water capacity as that of the large tenders of the conventional type carried on two six-wheel trucks which were received with the Class L-3 and L-4 4-8-2 type locomotives, but to have a wheel base about 6 ft. shorter. This would permit the 4-8-4 type locomotive, with its longer engine wheel base, to be handled on the 100-ft. turntables generally available on the main line between New York and Chicago.

These tenders have a coal capacity of 46 tons and carry 18,000 gal. of water. Incorporated in them, as the result of comprehensive studies and road tests, is the venting system for scooping water without reducing speed similar to that built into the large tenders behind the L-4 class locomotives.*

The tanks of these tenders are of conventional riveted construction. The ratio of loaded to light weight is some-

* The high-speed water scoop and the system of venting in these tenders were described in the October, 1944, Railway Mechanical Engineer.

what higher than that for the earlier high-capacity tenders with two six-wheel trucks.

The tender wheels are all 41 in. in diameter. Timken journal bearings are installed throughout.

Further Developments

For the purpose of investigating the effect of driving-wheel diameter on locomotive performance locomotive No. 6000 was delivered to the railroad with driving wheels 75 in. in diameter, but a set of 79-in. drivers was provided for later use. The original intention had been to conduct performance and capacity tests of the locomotive while equipped with the 75-in. driving wheels, then to replace these with the 79-in. drivers, increasing the boiler pressure to maintain the same tractive force, and then to place the locomotive in regular service. These plans were changed, however, and the locomotive was placed in road service with the 75-in. drivers. After making several trips between Harmon and Chicago, it was placed in Harmon-Cleveland service for several weeks. Then the 79-in. wheels were installed early in July and the locomotive was

Table IV-Axles, Bearings, Wheels and Tires

		Axles				Wheels or Tires			Wheel Centers	
Location	Material	Manufacturer	Bearings		Type and material	Manufacturer .	Diameter,	Type	Manufacturer	Diameter,
	Carbon-vanadium Carbon-vanadium	Shop made Shop made	Timken Timken	8¾ 13	Rolled steel	Carnegie-Illinois American Loco, Co., Railwa				
Drivers, other.	Carbon-vanadium	Shop made	Timken	121/8		Steel Spring Div. American Loco, Co., Railway Steel Spring Div.	75 75	Boxpok Boxpok	G.S.C.	68
Trailer, front.	Carbon-vanadium Carbon-vanadium		Timken Timken	61/2	Rolled steel	Carnegie-Illinois Carnegie-Illinois	36 44			
Tender	Plain carbon steel		Timken		Rolled steel	Carnegie-Illinois	- 41		****	



Pipes of rectangular section lead from the top sand box to lower sand storage boxes under the running board

Partial List of Materials and Equipment on the New York Central Class S-1a 4-8-4 Type Locomotive

bumper; pilot
Lateral motion device on front and intermediate drivers
Driving boxes; crank pins (main, in- termediate and rear); roller bear- ings on main and side rods and axles; crossheads; crosshead shoes
Springs, driving
Bearings and brass castings
Air brakes and air signal
Brake shoes
Automatic train control
Piston rod, hollow
Piston packing; rod and valve-stem packing
Piston valve; gun-iron castings; cylinder and valve bushings
Cylinder cocks; ashpan flusher cock; right blower valve; blow-off cocks; gauge-glass guards
Lubricator, mechanical
Lubrication-grease, fittings
Power reverse-gear lubricator Brick arch Lagging
Smokebox hinges
Superheater; pyrometer Throttle lever and throttle valve Washout plugs Injector; boiler checks

Engine bed; engine and trailer trucks;

American Locomotive Co., New York Franklin Railway Supply Co., Inc., New York
The Timken Roller Bearing Co., Canton Ohio Railway Steel Spring Div., American Locamotive Co., New York Magnus Metal Div., National Lead Co., New York New York Air Brake Co., Watertown, N. Y.
American Brake Shoe Company, New York General Railway Signal Co., Ro- chester, N. Y. The Timken Roller Bearing Co., Can- ton, Ohio
U. S. Metallic Packing Co., Phila- delphia, Pa.
Hunt-Spiller Manufacturing Corp Boston, Mass.
The Okadee Co., Chicago The Pilliod Company, New York

General Steel Castings Corp., Eddy-stone, Pa.

The Okadee Co., Chicago The Pilliod Company, New York
The Lunkenheimer Co., Cincinnati,
Nathan Manufacturing Co., New York
Alemite Div., Stewart-Warner Corp., Chicago
C. A. Norgren Co., Denver, Colo. American Arch Co., Inc., New York
Johns-Manville Sales Corp., New York
The Okadee Co., Chicago Flannery Bolt Co., Bridgeville, Pa.
Vapor Car Heating Co., Inc., Chi-
Cago The Superheater Co., New York American Throttle Co., New York
Huron Mfg. Co., Detroit, Mich. Nathan Manufacturing Co., New
York

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Feedwater heater	Worthington Pump and Machinery Corp., Harrison, N. J.
Feedwater-heater pump control valve.	The Lunkenheimer Co., Cincinnati,
Piping Steam-pipe casing Steam pipe to headlight generator	A. M. Byers Co., Pittsburgh, Pa. American Locomotive Co., New York Seamlex Co., Inc., Long Island City.
Bl w-off mufflers Stoker Stoker by-pass control valve,	N. Y. National Aluminate Corp., Chicago Standard Stoker Co., Inc., New York The Lunkenheimer Co., Cincinnati, Ohio
Fire door Coal sprinkler; steam and air gauges; safety valves	Standard Fire Door Co., Toledo, Ohio Manning, Maxwell & Moore, Inc., Locomotive Equipment Div.,
Low-water alarm Grates Running boards	Bridgeport, Conn. Barco Manufacturing Co., Chicago Waugh Equipment Co., New York Aluminum Co. of America, Pitts- burgh, Pa.
Cab windows	O. M. Edwards, Inc., Syracuse,
Headlight; conduit and wiring fit- tings; turbo generator	The Pyle-National Co., Chicago Nathan Manufacturing Co., New York
Whistle blower	Viloco Railway Equipment Co., Chi-
Bell ringer	Railway Service & Supply Corp., Indianapolis, Ind.
Sanders	New York Air Brake Co., Water-town, N. Y.
Speed and cut-off indicator and re- c rder Marker lamps	Valve Pilot Corp., New York Lovell-Dressel Co., Arlington, N. J.
Steam-heat connections; pressure re- ducing valves	Vapor Car Heating Co., Inc., Chicago
and tender	Barco Manufacturing Co., Chicago
Tender:	
Brake beams; clasp brake; slack adjuster Driver brake	American Steel Foundries, Chicago American Brake Div., Westinghouse Air Brake Co., Swissvale, Pa.
Coal pusher	Standard Stoker Co., Inc., New York National Malleable and Steel Cast- ings Co., Cleveland, Ohio
Draft gear Strainer Tank valve	Waugh Equipment Co., New York The Okadee Co., Chicago Crane Co., Chicago
Paint	E. I. du Pont de Nemours & Co., Inc., Wilmington Del.

	Onio
	A. M. Byers Co., Pittsburgh, Pa.
	American Locomotive Co., New York
+	Seamlex Co., Inc., Long Island City,
	National Aluminate Corp., Chicago
	Standard Stoker Co., Inc., New York
	The Lunkenheimer Co., Cincinnati,
	Standard Fire Door Co., Toledo, Ohio
3;	
	Manning, Maxwell & Moore, Inc., Locomotive Equipment Div.,
	Bridgeport, Conn.
	Barco Manufacturing Co., Chicago
b	Waugh Equipment Co., New York
	Aluminum Co. of America, Pitts-
	burgh, Pa.
	O. M. Edwards, Inc., Syracuse,
t-	
	The Pyle-National Co., Chicago
	Nathan Manufacturing Co., New

American Steel Foundries, Chicago American Brake Div., Westinghouse Air Brake Co., Swissvale, Pa. Standard Stoker Co., Inc., New York National Malleable and Steel Castings Co., Cleveland, Ohio Waugh Equipment Co., New York The Okadee Co., Chicago Crane Co., Chicago E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

assigned to one side of the Commodore Vanderbilt between Harmon and Chicago. Here it is running at the rate of about 27,000 miles a month and up to the middle of August had accumulated a total of about 60,000 miles. The Commodore Vanderbilt is a heavy train with a number of stops and is considered a hard run. So far the locomotive is said to have made easy work of it.

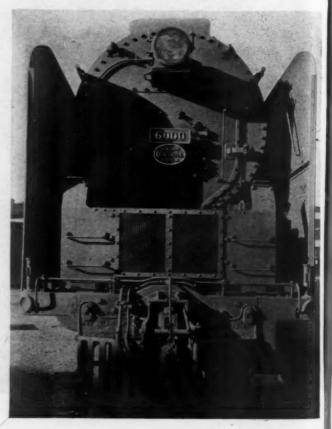
About October 1, 1945, locomotive No. 6000 will be withdrawn from service for complete boiler performance and capacity tests at Selkirk which will be followed early in 1946 by road tests to determine maximum capacity and efficiency of the locomotive.

Before locomotive No. 6000 was completed an order had already been placed for 25 additional S-1 locomotives. These locomotives, Class S-1b, are now being delivered. Because of the inability to test the S-1a locomotive before the others were ordered, the length of the combustion chamber in the boilers of the latter have been reduced from 921/2 in. to 811/4 in. and the tubes and flues correspondingly lengthened. These locomotives have 79-in. driving wheels and the cylinder diameter has been increased from 25 to 251/2 in. to accommodate a working pressure of 275 lb.

A further change in the S-1b locomotive is the trailer which has two pairs of 41-in. wheels. This change from 36-in. front and 44-in. rear wheels has permitted a further increase in ash-pan volume to 98 cu. ft. and has permitted the design of a pan with better slopes.

A twenty-seventh locomotive will be built to the same proportions as the 25 S-1b class. It will differ from them in that the Franklin poppet-valve system of steam dis-tribution will be installed. This locomotive will be designated as Class S-2a and is to be subjected to compre-

hensive acceleration, capacity and performance tests for direct comparison with the S-1 class, which has large piston valves and Baker valve gear.



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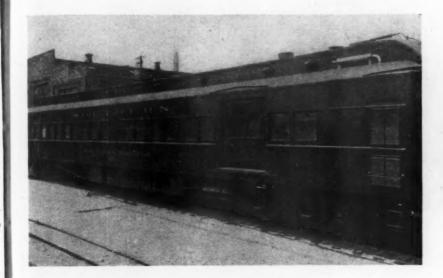
Ra

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Diesel Instruction Car



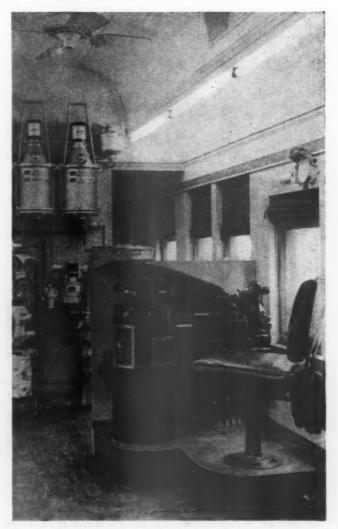
This car, to be followed by others, is employed in training operating and shop personnel on Western Lines in locomotive running repair technique

A DIESEL-LOCOMOTIVE instruction car equipped for training employees in the operation and maintenance of Diesel-electric locomotives has been placed in service on the Western Lines of the Southern. At least two other cars not identical in arrangement with this one are expected to be added, so that there will be one for each of the major operating territories on the railroad.

The supervisory forces in the mechanical department, including Diesel foremen, general foremen, road foremen, assistant master mechanics and master mechanics, have all been sent to La Grange, Illinois, for instruction at the school operated there by the Electro-Motive Division of General Motors. The school cars are intended primarily, therefore, to be used in training operating personnel in locomotive handling and shop personnel in trouble-shooting and repair and maintenance procedures.

This car was converted and equipped at the Chattanooga shops with all of the major shop points on the Western lines contributing to its completion by the preparation of one or more of the assembly installations required. The general project was under the supervision of M. D. Stewart, superintendent of motive power for Western lines, and the work was done under the immediate supervision of G. E. Snyder, general Diesel supervisor; M. B. Barnett, chief electrician; G. W. Gardner, air-brake instructor, and E. B. Shehee, general Diesel instructor, all of the Western lines. Mr. Shebee acts as instructor on the car.

Although charts, models and sectional parts will be used for class training where their need is indicated, the car has been so equipped that instruction is carried out so far as possible with actual operating parts or operating models tied in with the operation of these parts. An example of this is in the use of scale model trucks under a model of an A unit of an Electro-Motive 5,400-hp. freight locomotive which have motor-driven wheels which respond to the manipulation of the throttle at the engineer's control stand. This model unit is made to scale of $\frac{5}{32}$ in. per ft. and the body section is mounted on an air-operated piston so that it can be raised clear

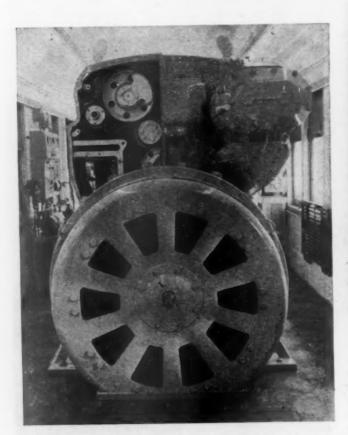


The locomotive controls

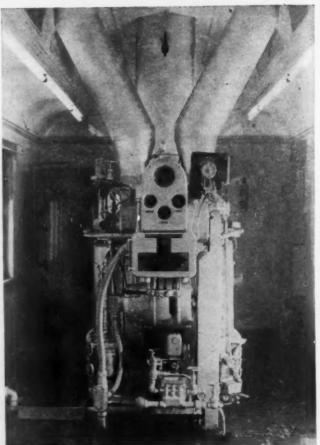


to permit observation of the individually motor-driven trucks.

Men being trained in the operation of a Diesel locomotive can move from the instruction car into the operator's seat on a Diesel and be completely at home because, in every respect except a clear view ahead down a track, the training set-up in the car duplicates actual conditions. The trainee, seated in the operator's chair, has before him all of the engineer's controls; a



Generator end of Diesel engine—The cut-away section of the engine shows some of the gears



The Vapor steam-heating plant

complete control stand with the locomotive throttle, transition lever and reverse lever; the control push-button box with an attendant's call, a master control, the generator field button, a fuel-pump button, defroster-blower button, and buttons for the number lights, gauge lights and classification lights. All of them are operative and control their respective parts just as they do on a locomotive.

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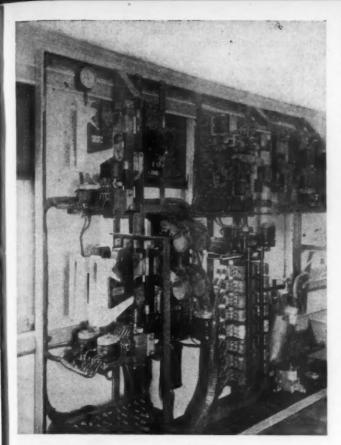
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Electrical equipment is complete and operates from cab controls— Trouble shooting is easily taught

The instrument panels are complete and register properly; the transition indicator is a complete and operating unit; the pneumatic control switch, to cut off fuel supply and reduce the speed of engines when a train control, overspeed trip or deadman application occurs, is connected to the operating engine section through the control panel and functions when the operating air-brake equipment is thrown into emergency. The manual reset button, usually referred to as a PC switch, is located in the same relative position in the car as in an actual locomotive cab. A complete cab installation of No. 8 ET brake controls is another part of the cab equipment which is correctly positioned with relation to the engineer's seat and this too is fully operative.

With these full sets of controls it is possible to duplicate any normal and many unusual and unexpected operating difficulties and to familiarize engineers with the functions of their controls and the limitations of their uses. Where road failures occur they will be reenacted in the instruction car for the benefit of the crew involved and all other operators. It is believed that this use of the car alone will aid greatly in reducing the possibility of road failures due to incomplete or improper understanding of the best operating practices under varying conditions.

Controls Operate Actual Parts

A four-cylinder section of an Electro-Motive 1,350-hp. engine has been installed in the car to demonstrate the action of the various engine parts. The right-hand side, showing two cylinders, is complete except that the top of the engine is cut away to show the operating appearance of the cylinder heads. On this same side the top of the housing has been cut away to show the action of the scavenger blower. On the left-hand side cutaways

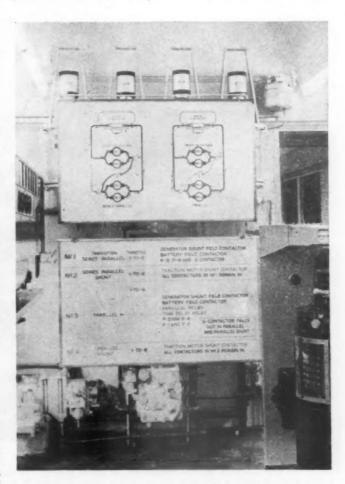
have been made to show the operation of the air separator, the gear train and the crankshaft. One cylinder head has been sectioned to show the operation of the valves. On the other cylinder on this side, the side wall and liner have been cut away to show piston action, the delivery of lubricating oil and the injection of the fuel oil through the injector nozzle. All of the cutaway sections are covered with sheets of clear plastic to prevent the possibility of accidents occurring by men getting parts of their bodies or clothing in contact with moving parts of the engine.

Plastic tubing is used for the water, lubricating-oil and fuel-oil lines so that their flow through the engine can be followed. An ingenious method of carrying trapped air bubbles in these various lines enables the flow to be followed readily. In addition, coloring matter has been added in all three systems which serves to identify the liquids flowing through the various pipe lines. All three liquids are recirculated by means of motor-driven pumps.

This engine section, which is complete with all gearing on both the front and rear ends, is operated from the engineman's control stand and permits explaining to operating personnel exactly what occurs within the engine in its working cycle. In addition it provides a means of familiarizing shop personnel with the various engine parts and their functions.

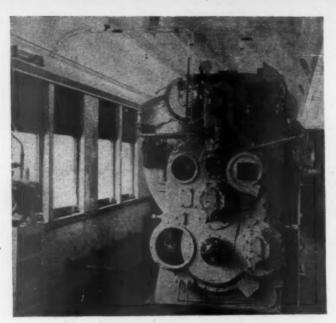
Electrical Equipment

The engine control and instrument panel, complete high and low voltage cabinets, and the distribution panel used on the 5,400-hp. freight Diesels are installed in the instruction car as nearly as possible as they appear in the engine



Charts are used to illustrate class lectures which are followed by actual demonstrations of operating matters discussed

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Front end of four-cylinder engine section—Parts are exposed for study by the use of clear plastic cover plates—Lubricating oil, water and fuel oil flow through lines made of clear plastic tubing

room on a locomotive. Space limitations make it impossible for them to be positioned exactly as they are with relation to the engine in a unit but as installed they operate in response to the regular engine controls. All switches, alarm lights, fuses and other parts of the elec-

trical system are connected and function to protect the equipment in the instruction car as they do on a locomotive.

Other equipment in use on locomotives which is duplicated in the instruction car include a complete automatic train-control installation for 32-volt operation run from a motor-generator off the 64-volt current supplied by the Diesel locomotive batteries. These batteries are kept up by a gas-engine-driven generator which has been installed in the closed-off vestibule section at one end of the car. There is also a complete fuel-pump assembly with the fuel filter and an emergency fuel trip. Although the fuel trip actually is located beneath the cab on a locomotive it has been located in the car for instruction purposes.

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The other major item of equipment which has been included in the operating exhibits in the car is a steam generator. Fuel and water tanks have been installed with this, which permit it to be operated during class sessions.

Models of gear trains and of a cylinder showing the operation of the fuel injector nozzle and valves are the most commonly used for instruction purposes. These with diagrammatic charts are used during the lectures delivered to class groups. However, with the size of class groups limited to about twelve men, formal lecturing is held to a minimum; actual demonstrations in which class members participate actively are to be relied upon as the best means of teaching men. The car is equipped with this idea in view and every effort has been made to provide a class room for training from which men can go to actual work and feel familiar with their surroundings.



Sovioto

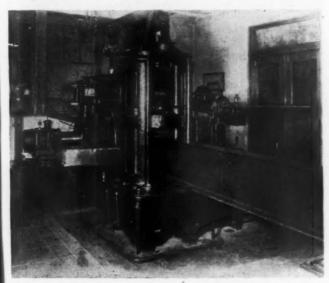
The first combined internal combustion and steam passenger locomotive in Soviet Russia—Built by the Voroshilovgrad Locomotive Plant

The steam cylinders of the locomotive are said to bring the speed up to 40 km. (24.8 miles) per hour before the internal-combustion engine is placed in gear—With both engines working together the speed of the loomotive is said to reach 120 km. (74.5 miles) per hour—Maizel, a Soviet engineer, is credited with the first suggestion of this combination of Diesel and steam power, the design of which was developed by the builder's engineers under the guidance of Pavel Soroka

Car Journal Oil

RECENT discussions and investigations by the A. A. R. Lubrication Committee in regard to hot boxes will no doubt help to minimize these failures, provided everyone does his part (1) by using a high-grade scientifically-compounded oil; (2) proper and suitable waste, having the least short ends; (3) the correct amount of oil and proper facilities for saturating and preparing the waste; (4) by properly packing boxes; (5) by inspection at periodic intervals, and (6) by using mechanically correct bearings (brasses and journals).

If these six functions are performed by men especially trained for the work, the number of hot boxes will be



Machine used in Iubrication tests at the Sinclair Refining Company plant, East Chicago, Ind.

greatly reduced. Where the oil is scientifically refined from the best cuts in the crude and properly compounded for high film-strength, low pour point, high flash and fire tests, high viscosity index and high capillary action, there will be little trouble as far as the oil is concerned and such an oil will give satisfactory and reliable performance during all seasons of the year.

Extensive research tests were made a few years ago on such an oil, using a specially designed testing machine at the Sinclair Refining Company's plant, East Chicago, Ind. This machine included an 8-in. railroad journal shaft and a standard journal box. The oil cellar designed to fit the journal box required from 10 to 101/2 lb. of prepared packing, i.e., 21/2 lb. of dry waste and 71/2 lb. of oil, this packing being prepared and used as in standard railroad practice. The speed of the machine could be varied up to 90 m.p.h. The load was applied by means of beams and springs using a Riehle machine. efficient of friction was obtained by calculating the pressure on a small platform scale. The coefficient of friction was comparative only because the two supporting main axle bearings (one on each end of the shaft) were not of the anti-friction or roller-bearing type and consequently are a trifle higher than if the anti-friction bearings were By A. E. Hickel*

Both laboratory and service tests indicate that summer and winter black oils do not produce results possible with one allseason high-film-strength oil

used. The temperature of the bearing (brass) was taken by means of a thermometer, which was within ¼ in. of the journal's center bearing, and a recording instrument thermocouple was set just below the thermometer well in the brass and within ¼ in. of the journal itself.

The wattmeter readings were calculated for actual horsepower input. A blower was used to simulate road draft under locomotives or cars while in motion. Chart 1 shows the results plotted from tests made with two different all-season car oils. Run 39 with car oil No. 44 and Run 40 with car oil No. 45, were both made on standard A. A. R. babbitt. The average speed was held at $42\frac{1}{2}$

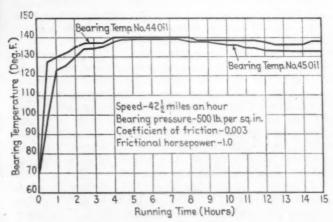


Fig. 1—Comparative test results with two all-season car oils on an A.A.R. babbitt-lined brass

m.p.h. constantly for 15 hr. without a stop. The bearing pressure was 500 lb. per sq. in. At the end of the run the machine was shut down overnight (8 hr.) and this same test was again duplicated the second day for 15 hr. at the same speed and pressure.

The highest bearing temperature of oil No. 44, as plotted in Fig. 1, was 140.8 deg. F., and the bearing temperature rise was 70 deg. F. The highest bearing temperature of oil No. 45 was 136.1 deg. F. and the bearing temperature rise was 69.1 deg. F. The average coefficient of friction for both days on both oils was .003 and the average frictional horsepower was 10.

Field tests in actual service, made with an all-season

^{*} Consulting lubricating engineer, Chicago.

high-film-strength oil on a northern railroad at 50 deg. F. below zero, were very satisfactory. At no time was waste packing pulled out and the lubrication at this subzero temperature was good. According to this test, no cut-back oil seems necessary if the right oil is used originally. Tests

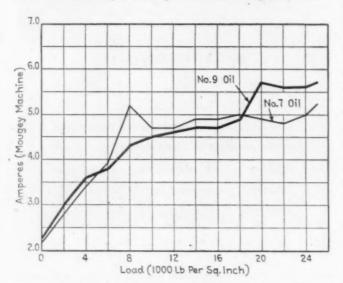


Fig. 2—Film-strength tests up to 25,000 lb. per sq. in. with two all-season car oils

made in hot climates showed remarkable results with such an extreme-pressure all-season car oil.

The oil most suitable for the average waste now in use by the railroads is a low-viscosity oil, having a low pour point, high film strength and a high vis index. The minimum viscosity should not be lower than 45 sec. at 210 deg. F. and, on a high film-strength oil, not less than 38 sec. at 210 deg. F. The oiliness or adhesion test rating should not be lower than 10 per cent at a temperature of 220 deg. F., although a high-film-strength (extreme-pressure) oil will show a rating of about 36 to 40 per cent adhesion at this temperature.

The film-strength test, as shown in Fig. 2, made on the Moughey machine on two extreme-pressure car oils was 25,000 lb. per sq. in. for each oil, as against an ordinary oil of 7,000 to 8,000 lb. per sq. in. The load-carrying performance of a high-vis-index oil is much greater at 250-260 deg. F. than an oil having a low-vis index, which indicates greater oiliness and adhesion, as well as less change in viscosity at these high temperatures, but there also must be a low rate of change in the adhesive property (affinity to metals) with temperature.

A suitable car oil must have high capillary action as shown in Fig. 3. This test was made by using a glass cylinder graduated in cubic centimeters and a ½-in. diameter glass tube of the same length, also marked off into cubic centimeters and attached to the cylinder with a rubber band.

The glass cylinder is filled with 30 cu. cm. of oil at room temperature and a four-strand worsted wool yarn about 5 in. long is inserted and immersed completely in the oil. When well soaked, the wool yarn is partially raised out of the oil and drained somewhat, an inch of one end being inserted in the top of the glass tube and four inches remaining in the cylinder. Feeding of the oil, due to capillary action, takes place at once and readings are taken every 15 min. during the first hour and every hour thereafter for 6 hr. The cubic centimeters of oil lifted over are plotted, as in Fig. 3; however, it is best to let the test continue overnight, so as to observe the total possible amount of oil lifted over in 24 hr. at the same room temperature. The total lift in inches in 24 hr.

was measured and plotted and amounted to $1\frac{3}{6}$ in. for oil No. 1, $1\frac{1}{2}$ in. for oil No. 2, and $1\frac{5}{6}$ in. for the No. 7 oil.

The oil having the highest capillary test would feed the best in actual service, provided all other factors, such as high film strength, oiliness, etc., are tested before hand and the oil meets the standard specifications otherwise.

The capillary test disproves the contention of some, that a thin oil will stay in the bottom of the box, or claims of others that it will work out too much in the back of the box. During the laboratory machine tests, it was observed that a bead of oil formed on the on-side of the brass which extended clear across the length of the brass. This excess oil, carried there by the high capillary action of the oil, assured a complete oil film on the journal bearing at all times and was held there by the rotation of the axle, and no loss of oil was noticeable.

By using a low-viscosity oil, as described, no doubt there would be a trifle larger consumption, although such was not the case in the laboratory tests. Granting that the oil consumption is somewhat more during the summer months, it still would be cheaper than hot boxes, delays and expensive repairs.

Most black oils are not suitable for all-year service, especially during the cold weather, as the oil congeals, gets sticky and has a tendency to pick up loose and small ends of the packing material, which accumulate at the edge of the brass and work underneath, causing waste grabs.

The used waste must be cleaned and free from short pieces before it can be used again. Reclaimed oil must be watched and tested before it is again used. The boxes should not be packed so tight that glazing takes place.

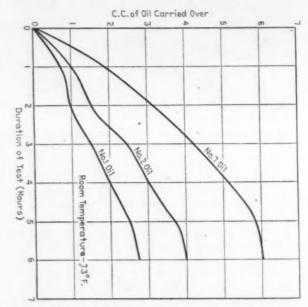


Fig. 3—Cubic centimeters of oil carried over by capillarity in test of three all-season oils

This glazing may occur even with a light or low-viscosity oil. The heavier black oils, of course, cause glazing much more easily.

An oil with high capillary action will feed to the top of the waste in any climate and sufficiently wet the journal bearing for proper lubrication. Railroads will have hot box trouble as long as all roads do not use approximately the same oil specifications and better yet, use the same oil. If some use a cheap black oil and others a high-grade oil, the oil will eventually be mixed, as cars are serviced all over the country, with the attendant probability of lubrication failures.

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Mexican Railways

Few realize the size of the vast, mountainous territory served by the National Railways of Mexico. Considering one line alone, from the Guatamala border to the United States border at El Paso, Tex., the distance is 2,580 railroad miles and, with its many branches linking the east and west coasts, it is indeed an immense system. Most of



Oxyacetylene bronze welding was used to join a rolled steel replacement section in the cast-iron cylinder

the railroad runs through mountainous territory and is consequently difficult for railroad operation, requiring constant maintenance of both rolling stock and track.

In the reclamation of material and reconstruction of locomotives and cars by the use of autogenous welding, it was necessary to perform work that would not be permitted under the regulations of the railroads in the United States. Without government regulations controlling the quality of material used and the limits of application, it was possible to extend the work in Mexico into fields prohibited in the United States. A sudden increase in freight to be moved created an emergency which had to be met with emergency measures.

It would be difficult to name any part of a locomotive or car, no matter how important, that has not been reclaimed by welding during this time, and with surprisingly good results. The railroads were not in a position to say that it could not be done. Locomotives and cars had to be moved to carry strategic materials essential in the manufacture of war materials to their destination.

There was no choice to be made in selecting the material for any particular job. It was necessary to use whatever the war effort could release to this country, and there were long delays due to priorities and material shortages in obtaining all materials. Old and obsolete welding

*Welding technician, United States Railway Mission in Mexico, Mexico City.

By J. W. Boyd*

Material shortages overcome by the extensive use of welding repair and reclamation—Lack of any limiting regulations allowed wide range of applications — Mexicans are skillful operators and the results have been good

and cutting equipment was renovated and returned to service and, in some cases, was redesigned to fit the supplies that were available.

One of the largest shops on the system, employing 35 cutting torch operators, was using five different makes of cutting torches, manufactured in as many different countries. Cutting nozzles and repair parts were almost impossible to get. To prevent a complete standstill, the nozzle that was the easiest to obtain was chosen as standard and new torch heads were made to suit the nozzle. Some of the equipment manufacturers would be surprised to see Swiss, Swedish or German made equipment sprouting torch heads of a United States design. This and many other ingenious practices were used to continue maintenance of motive power and equipment.

Before the war a large percentage of the electrodes used for arc welding was purchased in the United States, as the manufacture of this material in Mexico was inade-



Fabricated section made from boiler plate being fitted to replace missing part of cast-iron cylinder barrel

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A broken cast-iron locomotive cylinder being prepared for welding with the steel ring for the front face shown in position

quate and in its infancy. However, when the increased demand for the proper material put them entirely on their own resources, the quality of this material improved rapidly. Specifications were set up by the National Railways of Mexico for welding material, forcing the local manufacturers to improve their products. At present, welding electrodes can be purchased in Mexico that meet all of of the specifications of the American Welding Society and the Association of American Railroads. This was not only a great help to the war effort, but has also put Mexico on an even footing with similar industries in other countries.

The Mexican mechanic is very skillful, and the personnel in general is congenial and always eager to improve its knowledge and grasp new and improved practices. Difficult welding operations are performed frequently, and, in some cases, under unfavorable conditions.

The illustrations give an idea as to what has been accomplished here when new material could not be secured. They show a broken locomotive cylinder that was reclaimed and has since been in service for over two years. The large section of cylinder shown missing, could not be

found and a new cylinder was not available. Restoring this locomotive to service meant additional power to move rolling stock when locomotives were scarce.

The cylinder was made of cast iron and, as the missing piece could not be replaced, a fabricated steel section was substituted for the cast iron. The front face of the cylinder was formed from a piece of mild steel which is shown held in place by the cylinder head. The missing part of the barrel was formed from boiler plate and welded to the front face by the arc-welding process. The entire new steel section was then joined to the cast-iron cylinder, using the oxyacetylene bronze welding process. When the entire operation was completed, the cylinder contained four different kinds of metal: cast iron, steel, electric arc weld metal and bronze deposit. Although the cylinder was not removed from the locomotive, it was confined in a specially prepared furnace and carefully preheated before welding and stress relieved after welding.

These new sections of steel were so skillfully made and set in place by a Mexican mechanic, that less than ½ 6 in. of metal was removed when the cylinder was rebored. The locomotive was out of service only six days, whereas, had a new cylinder been applied, the time out of service would have amounted to at least twenty days, including the machining and delay in transportation. The work was done in May, 1943, and, as the locomotive has now been in service over two years, the savings in cost of a new cylinder can also be considered.

Similar welding operations are performed daily and it is safe to say that close to one hundred locomotive cylinders alone have been reclaimed in the various shops spread over the Republic of Mexico. These, together with the many locomotive and car parts that have been reclaimed and restored to service, have been largely responsible for keeping the railroad operating during these years of metal shortage.

In the maintenance of way department, miles of track have been reconditioned by building up battered joints by the oxyacetylene welding process. Deep-well pump shafts of 500 ft. in depth have also been reclaimed in this department by welding. Some of these practices are not recommended but necessity called for special effort and the emergency has been met successfully by the Mexican National Lines.

It would be well to mention that most of the members of the United States Railway Mission, that have been in Mexico, will carry back to the States with them, many new and improved practices in railroad maintenance that will assist in improving conditions at home.



Photograph from W. A. Lucas

This double-cupola observation car was used on the Canadian Pacific about 35 years ago

EDITORIALS

Small Shops— And New Tools

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ny at Recently, on a visit to a small railroad shop located on a road with about 75 locomotives, a discussion took place among some supervisors as to the justification for investment in new, and to them somewhat expensive, machine tools. This shop has about \$300,000 worth of machinery, at book value, in the machine shop and has a machine shop labor bill of around \$80,000 a year on the basis of single-shift full-time operation.

One supervisor took the position, in discussing a new machine recently installed at a cost of \$20,000, that is was necessary to save from two to three thousand dollars a year in order to justify the purchase of the machine and that this same amount of money would hire another man which in his estimation was worth more to the shop than a machine that might be used only four to six hours a day.

Here, without going too deeply analytical, is a practical question—the question of the value of a man or a machine.

This new machine is of a type that is suited to the production of more than 200 different locomotive and car parts and yet, after being in service for 30 days it was producing only about two dozen of the potential 200 because the new machine produced these two dozen different parts much faster and with infinitely greater accuracy than any of the old machines in the shop could have done, and was kept busy full time on work transferred from other machines in the shop. Here are two reasons why the savings effected by a new machine can be said to be more valuable than the same amount of money spent for additional labor. The extra man, working on an old machine would not make the same parts as fast and could not make them as accurately.

The new machine, as the months of its service go on and the operator and foremen get more familiar with it, will produce more and more of the potential 200 different parts until, at some future date, the shop accountant will find that the economies have not only paid for the new machine but that the transfer of work from the old machines have made it possible to retire several obsolete machines. Had the money been spent for labor it would merely have been expended and, at the end of the same number of years, the old machines upon which the labor was used would be that much older, that much more inaccurate and, in the end, the new machine would have to be installed.

Postponing the purchase of new equipment which has greater potentialities, of whatever nature, than old

machines now in their shop is merely a sure way of throwing away money in the perpetuation of obsolete machines which, with any kind or amount of labor, can never do the work that modern equipment can do.

Depression Thinking

During the lean years for the railroads before the war it was not uncommon to find that the size of mechanical-department forces, or at least the money made available to pay for labor on mechanical work, followed a curve which was roughly comparable to the carloading figures. This was not true on all roads but on quite a number it was a fact that mechanicaldepartment heads could almost gauge the amount of money which would be set up in their monthly budgets but a survey of carloading figures for the several weeks preceding budget meetings. However necessary this may have been it certainly did not encourage programming of work in the most efficient mannerif carloadings went up unexpectedly there was a windfall for the mechanical department and work—any work -was scheduled in order to spend the unlooked-for riches; if, on the other hand, carloadings dropped below what had been anticipated even the minimum scheduling which was attempted was seriously interfered with. Work stood incompleted in the shops until another favorable turn in the carloadings permitted it to be resumed. Schedules were nothing more than guesses of what work might be accomplished subject to revisions which were almost certain to occur.

Whether this idea that dollars, almost literally, had to be collected in freight revenues before they could be spent on maintenance or repair work was justified by circumstances is questionable. Certainly it was not economical, no matter how adequately it served to keep monthly accounting figures in relative balance. The inability to schedule work with any certainty that it could be completed according to schedule was a wasteful handicap to mechanical-department officers. Properly scheduled repair work permits every workman sufficient uninterrupted time at each job for it to be completed in the most efficient manner. A locomotive on a backshop pit that looks like an ant hill because of the number of men clambering over it and working around it to get it finished before a reduced budget goes into effect is not being repaired at minimum labor costs.

Great strides have been made in organizing various

shop operations through machine relocations, improved material handling and work-flow studies. Where these changes have been made their value in increased output and reduced unit costs have proved them to be worthwhile. The value of such work, however, is related closely to having a total shop load which permits maximum efficiency in utilizing facilities available. This calls for planning and planning is not possible on a hand-to-mouth basis. Monthly budgeting may still be necessary, but it should be monthly budgeting on an overall program which permits at least a minimum of scheduled repair work to be planned for and carried through to completion.

With the war strain removed there will be an increasing tendency to return to doing things as they were done in the years before the war. Immediately after V-J day caused a reduction in total carloadings, it is understood that as in the past, orders went out on a number of railroads to reduce mechanical-department forces. It seems that wide-awake mechanical officers should fight this trend, if it is a trend, back to depression thinking. Carloadings and the labor force are not directly related, work requirements and needed labor for its accomplishment are closely related. Efficiency in shop operation, minimum unit repair costs and maximum mechanical performance of cars and locomotives will be vital factors in the coming battle for transportation revenues. Maintaining them will require intelligent planning and, perhaps, a fight for the right to achieve them.

Good Lubrication Vitally Important

No truer statement was ever made than that the industrial development of any nation is limited by the amount and quality of lubricants it can obtain to keep machinery moving. In fact, one of the most potent reasons for the defeat of Germany in the war just ended was undoubtedly the effective action of the allied nations in disrupting not only the supply of gasoline but lubricants essential to Germany's massive war machine.

Railroads also cannot run without proper lubricants and lubrication and, particularly at the present time when the load on motive power and car equipment is still being sustained at near maximum levels, equipment failures on the road can be minimized only by constant intensive efforts to improve lubrication conditions. Consider the variety of lubricants required on a steam locomotive alone which include steam valve and cylinder oils, driving journal compounds, crankpin lubricants, pressure gun lubricants for valve-motion parts, roller-bearing greases and oils, air-pump lubricants, car and engine oils, hub-plate and shoe-and-wedge lubricants, flange oils, headlight generator lubricants, feedwater-pump oils, etc. A tremendous

amount of research in the aggregate, on the part of both oil companies and the railroads, has entered into the development of satisfactory lubricants for this wide variety of uses.

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Locomotive valve and cylinder oils have been developed to stand progressively higher steam temperatures and piston speeds and railway experience and good judgment of the highest order are required in specifying the kind and quantity of valve oil necessary for best results in the various classes of locomotive service. Similar effective consideration must be given to the question of driving-journal compounds which normally have to lubricate satisfactorily at femperatures from zero or lower to 250 deg. F., or even higher when crown brass pinching, tight wedges, improper weight distribution or other mechanical causes tend to result in hot boxes. Crank pin greases, pressure-gun lubricantion and roller bearing lubricants also require specialized attention and the best co-operative effort of experts in both the oil and railroad fields if lubrication failures are to be avoided in locomotive and car equipment.

As one typical detail, take the question of brakecylinder lubrication, in which the lubricant is required to prevent wear of metal parts, preserve packing cups for a substantial period of time and seal the cylinders against air leakage in brake application. This lubricant must be of such a character that it will not be washed away by moisture condensed when the compressed air cools. Moreover, the improved lubricant now recommended for use in brake cylinders is not only water-insoluble and designed to promote increased packing-cup life but, owing to elimination of a slight amount of water formerly used as a bond, has a higher melting point and increased stability of the grease under relatively high temperatures, such as often developed in locomotive brake cylinders due to their location. The amount of research which oil companies and air-brake manufacturers have put into developing satisfactory air-brake lubricants, alone, is very large and railroads will "miss a bet" if they fail to take full advantage of the research and experience of these joint industries.

These facts and numerous others bearing on railway lubrication problems were presented in a comprehensive discussion of the subject by A. D. Pendergast of the Texas Oil Company at the April meeting of the Northwest Locomotive Association. Railway equipment, including all types of locomotives, freight cars and passenger cars, is now being used with an intensity which has placed exacting requirements on both railway man-power and equipment. Less time out for repairs, quicker dispatchments and shorter turnaround times are required. This means that repair work and servicing must be minimized which can be assured only by effective lubrication, the specification of lubricants especially prepared for railway service and the use of proper methods, tools and equipment in the application of these lubricants.

Steam-Locomotive Evolution Continues

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The past 20 years have been a period of intensive development of the steam locomotive on the New York Central. The tangible steps began with the 4-6-4 type locomotive design, known as Class J-1, which culminated in the design of the Class J-3, first built in 1938. Then came a period of improvement in the 4-8-2 type, long the principal type of New York Central freight locomotives. The L-4 class, which to date is the last word in this phase of the development, is an effective passenger locomotive as well as a freight locomotive. On another page in this issue another step in this development is described. This is the Class S-1a locomotive, a 4-8-4 type.

Something of the objectives and accomplishments of these two decades of development on this railroad are indicated by the comparison of the J-3, the L-4 and the S-1a classes, each of which represents the present status of its type. The Class J-3 locomotive develops a maximum indicated horsepower of just under 4,800; the Class L-4, 5,470. The S-1a, pending tests, is expected to deliver a maximum of 6,000 i.hp. This represents a horsepower output per driving axle of 1,500. This is not much different from the 1,576 hp. per axle of the J-3 class, but is a much more intensive output than the L-4 class at 1,368 hp. per driving axle.

The Class S-1a estimated boiler performance exceeds that of both the other two locomotives. These each have approximately the same ratio of firebox heating surface to total evaporative heating surface (0.086 for the J-3 class and 0.080 for the L-4 class). The total evaporation of the Class J-3 was 96,000 lb. and the Class L-4 103,000 lb. Thus each developed a fraction over 22 lb. of evaporation per square foot of evaporative heating surface. The new boiler is expected to evaporate up to 125,000 lb. and if it does, it will be at the rate of 27 lb. per square foot of evaporative heating surface. This expectation is, no doubt, based largely on the change in ratio of firebox heating surface to total evaporative heating surface, which has been increased to 0.112.

There is little variation in weight efficiency among the three types. The pounds of engine weight per indicated horsepower are, respectively, 76.2 for the Class J-3, 72.5 for the Class L-4, and 78.5 for the Class S-1a. In the matter of counterbalance, however, none of the three locomotives are alike. While the reciprocating parts of the L-4 and the S-1a are approximately the same, the overbalance on the S-1a locomotive has been brought down to 387 lb.—97 lb. per wheel. For the L-4 and J-3 locomotives, respectively, the overbalance is 543 lb. and 493 lb., which is equivalent to about 136 lb. and 164 lb. per driving wheel, respectively. The weight of the unbalanced reciprocating parts per ton of locomotive is 3.34 for the J-3 locomotive and about 5 lb. for each of the two eight-coupled locomotives. The

counterbalancing of all of these locomotives is well within the limits for satisfactory performance suggested by the report of the A. A. R. Counterbalance Test for Locomotives for High-Speed Service.

Traction Gear Maintenance

Two reasons for Diesel traction motor failures were offered in the September issue of Railway Mechanical Engineer in an editorial entitled "Temperature or Vibration?" It is the contention of some operators that unequal heating of coils and core causes coils to move longitudinally in the slots causing the breakage of end turns and the appearance of a ring of powdered mica around the armature near the ends of the coil slots on the pinion end.

A second explanation for this condition, is that it is caused by high frequency vibration. It is said that gear and pinion teeth slide as they come into mesh, rock or roll as they pass center position and slide again as they part company, leaving a high spot at the center of the tooth contour. This condition, it is contended sets up vibration of twice the tooth frequency which is detrimental to electrical insulation.

The experience of at least one road denies this theory. It has been found that pinion and gear teeth wear most at the center, half way between the tip and the root, and that when this wear exceeds 25 or 30 thousandths of an inch the tips of following pinion and gear teeth will strike upon coming into mesh causing excessive vibration or broken teeth. One method used to avoid this circumstance, is to regrind the contour of the pinion and gear teeth before the wear reaches a dangerous amount. The grinding restores the original curvature of the tooth surface and also removes the shoulder which is formed near the root of the tooth as the tooth wears. Two railroads are now doing contour grinding.

Others contend that gears and pinions should be matched, that a gear and pinion should be kept together throughout their life. This they say will avoid trouble. This the gear grinders say is obviously bad practice since bearings and bearing fits wear, and when they are restored, any "matched" pinions and gears will no longer match and gear teeth will strike shoulders worn in pinion teeth.

Still others say it is the pinions which suffer the most wear and if they are changed out often enough there will be no gear-pinion problem. It is their contention that the price of replacement is less than the cost of restoration.

Whatever the solution may be, it is a problem which calls for the meeting of minds and a comparison of experiences since broken pinions or gears means locomotive failures and expensive maintenance operations. The subject seems to suggest itself as something for the consideration of a railroad association committee.

IN THE BACK SHOP AND ENGINEHOUSE

Streamline Railroad Shop Layout

By H. H. Jones

Part of the postwar program of planning for the railroads, with the keen competition they will face from the air, the highways and the waterways, should be "streamlining their shop layouts" and doing all they can to secure increased production with minimum costs. High wage scales are here to stay, and the only way the railroads can stay out of the red in the postwar days is to install the very best and the most efficient equipment and facilities that are available. In addition to the purchase and installation of the best equipment obtainable, they should also pay more attention to the proper location and installation of such equipment.

The photograph shows just how streamlining railroad shop layouts can be done, and with very little cost. The illustration shows two typical railroad shop groups or departments, namely: the crosshead group and the piston group. The proper machines and other equipment were selected and arranged in the proper locations to give improved production. The same procedure can be followed in all the other departments, and much backtracking can be eliminated, as well as the unnecessary handling of materials. Work flows in the direction the arrows point.

Another feature of this type of layout is the material zones indicated by the wording "put material here." With this arrangement, it is not necessary to pile work around the machines. This is also a safety feature and helps to keep the shop clean and orderly. Two walkways and drive-ways with connecting passages are provided. The space around all machines is clear of material and racks for storing the material have been provided.

In making layouts of this kind, the location of the machines can be changed until the desired layout has been secured and then the entire layout can be photographed and as many copies made as needed, the scale used is ½ inch to one foot. The templates are made of

soft pine or other material ¼ inch thick. These layouts can be used to stress the importance of the selection of the right kind of machine tools for doing the work in each of the departments. The proper location of machine tools in any shop is of the utmost importance and should receive much more attention than it has in the past.

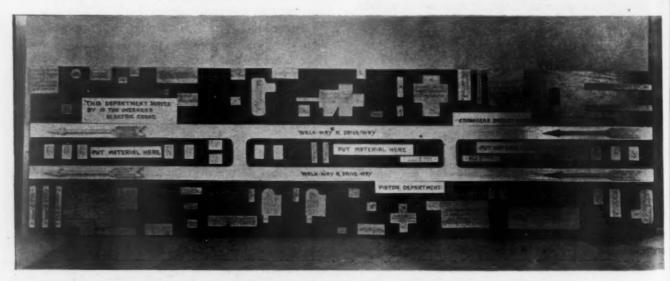
Removing Draft Gears And Couplers on a Pit Track

A device used for removing couplers and draft gears from Diesel-electric locomotives undergoing repairs at the Wayne Junction electric shop of the Reading has reduced the length of time required for the operation and eliminated the need for using overhead crane facilities in the shop. The saving in crane time was especially important in this busy shop where the railroad's multiple-unit suburban equipment is also maintained and repaired.

The device consists of a yoke built to house an airmotor-operated standard jack on a bed plate in the yoke. A plate to support a coupler or draft gear is fastened to the end of the ram of the jack. Guide rods on the corners of the plate run up or down in pipe sections which are welded to the side members of the supporting yoke. Pins dropped in holes drilled through the table plate prevent side movement of a coupler or draft gear on the plate.

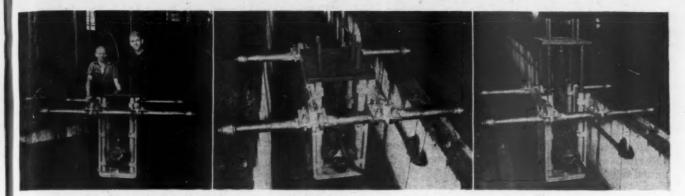
The supporting yoke is mounted on two axles with wheels attached and is moved on the regular track rails.

Motor-driven, vertical-spindle, cup-type grinding wheels, mounted on planer tool heads, have been used for this purpose, but a more powerful grinder application with horizontal spindle, as shown in one of the illustrations, has been developed and successfully used at the Decatur shops of the Wabash. This grinding attachment is applied to one of the tool heads of an 84-in. Niles planer. The 20-in. by 2½-in. face grinding wheel is mounted on a 3-in. horizontal spindle 32 in. long, supported in roller bearings with the housing bolted to a vertical plate, 1 in. thick by 15 in. wide by 34 in. high, which

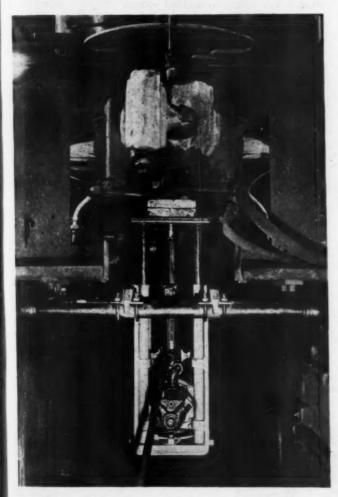


A layout board used in deciding upon the most efficient work-flow arrangement of shop departments

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Left: Machinist John Woffenden and Blacksmith John Aicher with the draft gear removing device which they developed for the Reading—Center: The device ready to be moved under a locomotive—Right: The device with the ram extended showing the table guide rods



Jack positioned underneath a Diesel-electric switching locomotive for the removal of the coupler and draft gear assembly

carries a 10-hp, induction motor at the top and is itself bolted to the cross-rail head by means of two 1½-in, studs and a bolt through the swivel on the clapper box.

The motor and spindle center lines are spaced 18 in. apart and power is supplied from the motor to the grinding wheel spindle by multiple V-belt drive. Slack in the belt drive is taken up by adjusting the motor position by means of slotted holes in the supporting plate. The motor speed is 1,200 r.p.m. and the use of a 5-in. upper pulley and a 7-in. lower pulley gives a grinding wheel speed of approximately 860 r.p.m.

This grinding attachment is powerful, smooth and accurate in truing the worn pedestal ways of roller-bearing

locomotive boxes and, of course, can also be used for many other grinding operations. Dependent upon the amount of box wear, a pair of roller bearing boxes can have the pedestal ways trued with this grinding attachment in about 8 hr. When not in use, a bracket on top of the grinder permits lifting it with the shop crane and attaching it to a bracket bolted to the side of the planer frame where it is stored in an upright position, out of the way and not subject to damage.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Matching Rivet Holes

Q.—How are the spaces between the rivet rows determined when laying out the welt strips for a longitudinal seam, so that they will match up with the rivet holes in the shell course?—R. K.

A.—The general practice is to lay out a full-size cross section of the seam and scale the spaces between the rivet holes on the neutral diameter of the inside and outside welt strip. These dimensions can also be derived by the use of the proportional method as follows:

$$R:A=R':X$$

ther

$$X = \frac{R' \times A}{R}$$

where

R = neutral radius of shell.

R' = neutral radius of welt strip.

A = space between longitudinal rivet rows (shell).

X = space between longitudinal rivet rows (welt).

Oil in Boiler Water

Q.—What effects does lubricating oil found in exhaust steam that is returned to the boiler, as condensate from the feedwater heater, have on the boiler?—F. M. P.

A.—Lubricating oil in the exhaust steam, when condensed and returned to the boiler, will coat the heating surface of the boiler with an insulating film which re-

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ne at tards heat transfer. This oil acts also as a coagulent which unites the finely divided solid material in the boiler water and creates a plastic film that adheres to the heating surfaces. The insulating effect of oil and oily deposits may cause overheating and subsequent failure of tubes and firebox side sheets. The presence of oil in the boiler is always a source of possible injury to the boiler, as well as the cause of a loss of boiler efficiency and capacity.

A locomotive equipped with feedwater heaters using exhaust steam from the cylinders as a course of heat should be equipped with condensate oil separators, that will remove the oil from the condensate before it is per-

mitted to be returned to the boiler.

Overcoming Warping In Flame Cutting of Plate

Q.—When fabricating feedwater pump brackets out of ¾-in. steel plate, using a flame cutting machine to cut the plates, we are experiencing trouble with the plate warping and buckling. How can this warping be overcome or prevented?—M. I. K.

A.—The plate should be held rigidly in line by clamping it to a bedplate or other rigid member that will resist expansion and contraction movements of the material. If the plate or part cannot be held rigidly during the cutting operation, the effect of expansion and contraction can be nullified almost completely by making two or more cuts simultaneously or in rapid succession about the neutral axis of the member. This tends to equalize the forces set up and to neutralize their effect.

Plate under 3% in. or over 34 in. in thickness are seldom warped or buckled perceptibly by flame cutting unless they are long and narrow. For splitting long narrow plates or pieces the method of skip-cutting is occasionally employed. In this application the cut is made to skip at intervals depending largely on the character of the work, which leaves a series of uncut sections along the line of the cut edge which are about 1 in. long. These uncut sections hold the material in line until it is cooled. They are cut through then to separate the parts. Quenching the cut progressively also has been used effectively on long narrow sections. The same effect can be gained by making several simultaneous cuts with two or more torches or blowpipes, which are moved together along parallel lines.

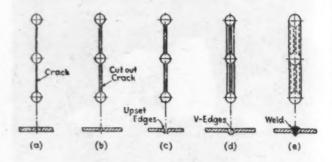
Where unusual accuracy is demanded in the dimensions of flame cut parts, correction factors must be applied in making the cutting layout, particularly if the plate or part is preheated.

Welding Cracks At Staybolt Holes

Q.—What is the best procedure for welding a cracked firebox side sheet? The crack is on both sides of the staybolt hole, with one of the cracks extending to the adjacent staybolt. Should the entire area be cut out and a patch welded in place or is it satisfactory to vee out and weld the cracks without a patch?

—M. I. K.

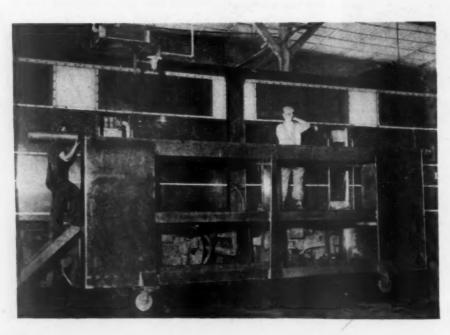
A.—When a crack in the firebox side sheet extends from staybolt hole to staybolt hole, it is satisfactory to weld it if the crack is in a straight line. In no case should any crack so welded extend through more than two staybolt holes. If the crack extends through more



Welding cracks in firebox sheets

than two holes or if there are other cracks adjacent to it a patch should be used.

The general practice in repairing a crack in the firebox sheet is to cut out the crack with an acetylene torch as illustrated in (b) of the drawing, making the smallest cut possible. Next the edges of the crack are upset as shown in view (c) driving the plates in from the fireside of the sheets and forming a V-shaped opening as shown in (d). The entire opening, including the staybolt holes is then welded as shown in (e), and redrilled and tapped for staybolts.



A movable working platform which has shelves for parts and tools needed in the repair of Diesel-electric locomotives.—It is in use at the Willard, Ohio, shop of the Baltimore & Ohio

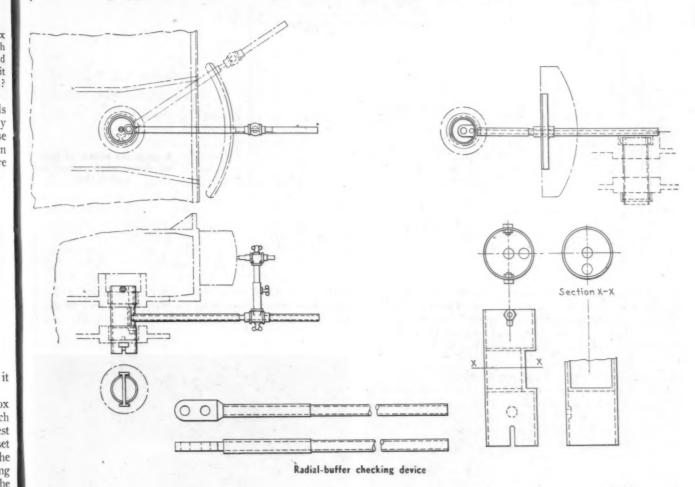
Overcoming Hot **Engine-Truck Boxes**

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Some roads are still confronted with the problem of eliminating hot engine-truck boxes on locomotive equipped with wedge-type radial buffers. The problem was When the bushing is set and secured, the center pin used to square the bushing is removed and the checking arm is radiated from a hole 11/2 in. ahead of the center. This provides a perfect setting of the chafing iron to be made in the final installation. With this arrangement the wedge must have a device for positive setting to prevent it



solved on one road because of frequent derailments. Trouble was experienced with locomotives being derailed after negotiating a 17-deg. curve entering a station. While negotiating this curve the radial buffer would move in excess of its normal travel and, sometimes, would stick. The locomotive would then move onto tangent track in a cocked position and derail at the first frog.

This condition was so aggravating that the chafing iron on the locomotive was turned at a radius $1\frac{1}{2}$ in. less than the radius at which it was set. With this arrangement the adjusting wedge was set on straight level track to insure it against being too tight. Then, when the locomotive negotiated a curve the chafing iron would relieve itself and no further trouble was experienced with derailments.

Before the use of this arrangement, hot engine trucks were almost an every day experience. After this change was made in the machining and setting of the chafing iron, hot engine trucks stopped almost entirely. During the year 1944 an average of only one hot engine truck bearing was experienced for every six million locomotive

The drawing shows a checking device used for setting of the chafing irons. A bushing which holds the checking arm is inserted in the drawbar-pin hole. Two holes 11/2 in. apart are provided to set the bushing square in the hole.

crawling on curves. This can be accomplished by the use of an ordinary driving-box wedge bolt.

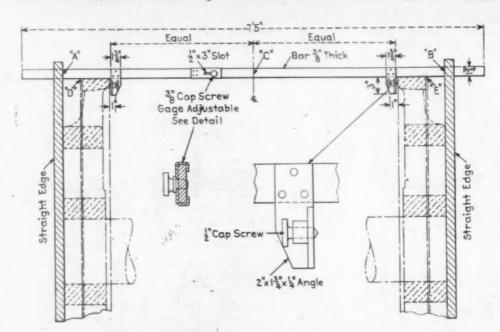
Squaring Driving-Wheel Centers

The importance of squaring driving-wheel centers and mounting tires so that they will be properly centered. spaced and run true is of course generally recognized and the gage shown in the illustration is an important aid in achieving these objectives at the Silvis, Ill., locomotive shop of the Chicago, Rock Island & Pacific.

In the drawing is a gage and method of squaring wheel centers to permit the proper application of driving tires so that flange wear will not develop. The gage consists of two strips of 3/8-in. by 13/4-in. steel, having a riveted bracket and 1/2-in. cap screw near one end of each and joined a little off center by a double-flanged slide fitting which permits adjusting the strips and bracket spacing any amount up to 3 in. by means of a slot and cap screw.

A straight-edge is laid against the hub of each wheel center, the gage being placed between the wheel centers as illustrated. Line A is scribed from one straight-edge and Line B from the other, center line C being then established on the gage midway between these two lines. It is obvious that, since the outer edges of the wheel centers

ing or removing chucks on a lathe spindle. As shown the rest sits upon the carriage ways on the lathe and supports



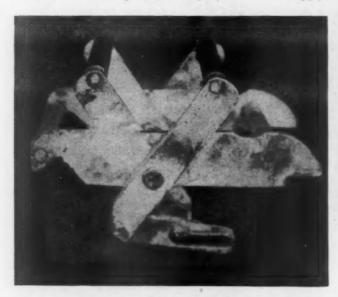
A gauge and method of squaring driving-wheel centers and spacing tires

at D and E serve to position the driving wheel tires and flanges, the wheel centers must be machined, or turned to make distances AD and BE equal. Moreover, they must be such that, when tires are applied up to the lip on each, the spacing back to back will be $53\frac{1}{4}$ in.

The practice in boring tires on the Rock Island is to leave a lip on the tire so as to permit it to face against the outside of the wheel-center rim, as stated. Subtracting the desired back-to-back spacing of the tires from the distance DE will give twice the depth which the tires must be bored from the outside face to the lip.

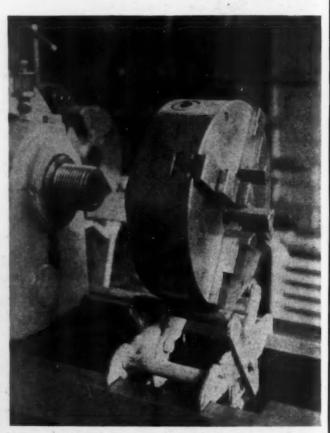
Steady Rest For Lathe Chucks

The toolroom foreman at the Princeton, Ind., shops of the Southern has developed the steady rest shown for apply-



The steady rest can be adjusted to accommodate various sizes of chucks

the chuck while it is run onto or off the spindle. It is so made that either large or small standard chucks fit upon the same rest depending upon whether it is in the raised



A lathe chuck in position on the steady rest which moves on the carriageways of the lathe

or collapsed position. The supporting cross-pieces on the rest revolve so that a chuck can be applied to or removed from the spindle by hand with a minimum of effort. 19

With the Car Foremen and Inspectors

Wheel Car and Wheel Dollies

The idea of the wheel car, shown in the illustration and originally suggested by the Chicago, Milwaukee, St. Paul & Pacific has been adopted by the Northern Pacific and used with good results, 25 of these cars being now in service and 10 more now under construction. Among other advantages, the following have been listed, as compared with handling wheels by the former practice on flat cars.

Full Utilization of Weight Capacity of Car: By reason of double-tier loading, 38 or 39 pairs of wheels can be loaded on a 36-ft. car, whereas but from 19 to 20 pairs may be single-tier loaded on a 40-ft. flat car. One special car thus does the work of two ordinary flat cars.

Labor Saving: The provision of wells or slots in channels permanently secured to the car deck, into which the lower tier of wheels is placed, and the interlocking method of loading upper tier of wheels eliminates costly blocking required when loading wheels on ordinary flat cars.

Safety: The manner of loading on this special car eliminates danger of the load becoming disarranged and possibly dislodged due to failure of blocking to hold on ordinary flat cars under switching shock.

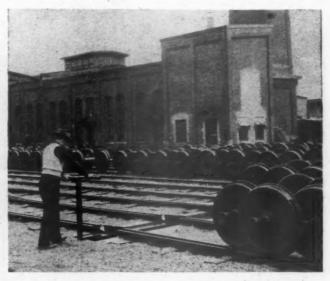
Reduced Damage to Axles: The liability of axles becoming damaged by reason of disarrangement of the load is eliminated.

Reduced Car Maintenance Cost: Decks on ordinary flat cars are severely damaged and require frequent replacement when cars are used for handling mounted wheels.

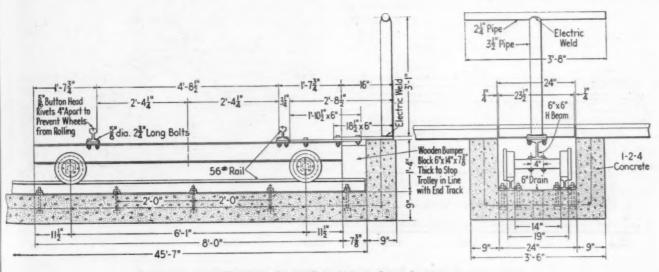
In view of these evident advantages, plans were developed on the Northern Pacific and, in the early part of 1942, ten cars were constructed for trial use between the South Tacoma wheel shop and repair tracks at Pasco and Parkwater, Wash., and Missoula, Mont.

Cars were constructed from the underframes and trucks salvaged from condemned 36-ft. 40-ton box cars, utilizing second-hand beams and channels for slotted wheel-carrying members and their supports.

The use of these 10 cars proved that anticipated advantages were realized and in 1943 an additional 15 cars were constructed for use in handling mounted car wheels between three additional wheel shops and 10 additional repair track points. The Northern Pacific is now constructing 10 additional cars for handling mounted freight car wheels between wheel shops and four additional repair track points, also five similar cars with wheel slots arranged for handling 36-in. steel passenger-car wheels between the South Tacoma wheel shop and the Seattle



Wheel-transfer dolly in operation at the Como shops



How the wheel dolly is built at Como shops

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coach yards, also at the St. Paul shops and coach yards. It is expected that, by the end of this year, a total of 40 of these special wheel cars will be in service hauling mounted car wheels between four wheel shops and 19 repair points and coach yards on the Northern Pacific.

Wheels are loaded on and unloaded from cars at wheel shops by means of locomotive type cranes which are also used for loading and unloading other types of materials used in railroad shops. At repair points, wheels are loaded and unloaded by means of jib cranes, fitted with 1½-ton air-motor-operated hoists.

Double-track wheel storage facilities are provided at repair points, where wheel carriage dollies or transfer tables are used for transferring wheels in the storage area. os swea a odktl

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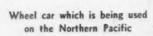
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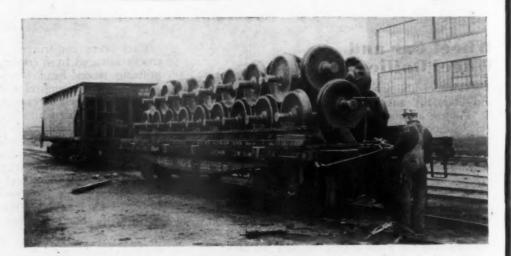
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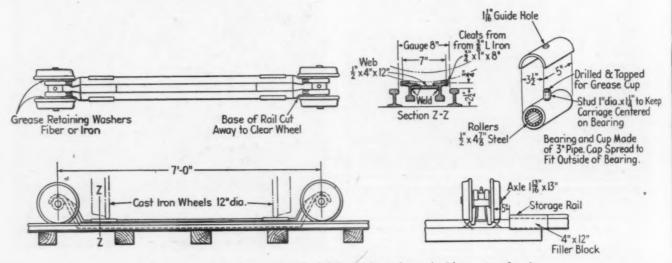
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Typical wheel storage tracks at Northern Pacific shops



Another type of Northern Pacific wheel dolly which can be used without a transfer pit

Small wheel transfer tables of the design shown in one of the illustrations are in use at Livingston and Como Shops. No cars are moved over wheel storage tracks so no bridge across the break in the rails is needed.

Referring to the drawing, it will be noted that this wheel dolly consists of a 6-in. H-beam, 8 ft. long, mounted on flanged wheels which roll on two 56-lb, rails in a 24-in. by 16-in. pit crossing the wheel storage tracks at right angles. The H-beam carries two short sections of rail which bridge the gap over the pit and two slight depressions ground in the short rail sections serve to keep a pair of wheels in place after being rolled onto the dolly. A substantial vertical post and cross handle on the dolly enable it to be easily pushed in line with any pair of tracks in the wheel storage area.

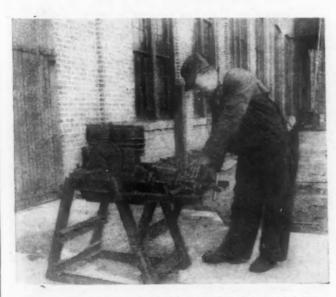
Another type of wheel dolly, which is successfully used on the Northern Pacific for transferring wheels at storage tracks and has the advantage of not requiring a cross pit in which to operate, is shown in the second drawing. This consists of a double inverted rail construction, quite sharply turned upward at the ends and bent to enclose bearings for four carrier wheels which move on two cross tracks extending at rail level over

the storage tracks.

Reference to the drawing will show the construction of this dolly. The double-wheel centers are spaced 7 ft. apart and the depressed inverted rails move between the cross rails at a level only slightly above them. A pair of wheels, easily rolled onto this dolly, is automatically centered and may then be moved to any pair of tracks in the storage area. No handle is provided on this dolly, which is readily moved by pushing on the wheels.

Freon Compressor Repair Stand

In the maintenance of passenger-car equipment, overhauling and testing Freon compressors is an important detail and this work is greatly facilitated at the Burnside, Chicago, shops of the Illinois Central by a special stand on which the compressor is placed and handled throughout the entire operation. Prior to development of this stand, the Freon compressors had to be moved by an



Freon compressor stand developed at the Burnside shops of the Illinois Central

overhead crane to the shop bench, which meant waiting until one was available. After placing the compressor in position for overhauling it had to be changed in position frequently, involving considerable manual labor and entailing some danger of pinched fingers if not more serious

hand injuries.

Under the new arrangement, the compressor, which weighs approximately 450 lb., is handled by a boom crane and hoist and placed on the stand where it is conveniently and safely overhauled by means of a revolving device. A circular plate with a shaft extending out about 6 in. is fastened to each side of the compressor, and one plate has a series of holes drilled around its circumference to provide a locking arrangement to hold the compressor in any position desired. This facilitates easy working on any part of the compressor simply by revolving it in the stand. Two arms extending from the stand, which consists essentially of small steel channel sections joined by welding, support the air motor used in running and testing the compressor oil seals.

When repairs are completed, the air motor is placed on the arms and connected to the compressor, and after the motor is started, no further attention is required. Formerly constant attention was essential while the compressor was being tested. By eliminating the hazardous and inconvenient method of handling these compressors under the old method, repairs and tests can be made faster and

with greater safety.

Air Brake **Questions and Answers**

HSC Equipment on Passenger Cars and Diesel A and B Locomotive Units Brake Application

307-Q.-How does the speed governor function when train speed reduces below 40 m.p.h.? A .- As train speed reduces below 40 m.p.h. the speed governor deenergizes the M magnet, which causes the release of pressure from diaphragm chamber N through choke 140 and the inshot portion exhaust, and thus establishes the 60 per cent ratio on diaphragm 64.

308-Q.-How does the speed governor function when train speed reduces below 20 m.p.h.? A.—As speed reduces below 20 m.p.h. the speed governor energizes the L magnet, which causes the release of pressure from diaphragm chamber K through choke 142 and the inshot valve exhaust.

309-Q.-What controls the rate of reduction in braking pressure as the train speed decreases? A.—The chokes 138, 140, and 142 control the rate of exhaust from diaphragm cavities P, N and K to produce a gradual reduction in braking pressures as train speed

310-Q.-Referring to the quick service valve (Fig. 28), what takes care of brake fluctuation sufficiently to reduce the brake pipe pressure? A .- Air from the straight air pipe builds up through passage 4 and chamber C under diaphragm 22. At approximately 5 lb. this pressure overcomes spring 29 and deflects the diaphragm 22, moving the follower and its guide. Spring 28 is compressed and seats cut off valve 27, closing connection between passage 3 and the exhaust EX. In the event that the brake pipe pressure in chamber A is reduced due to local brake fluctuation, a reduction in brake pipe pressure will be prevented by the closed cut off valve.

Release After HSC Application

311—Q.—How is the braking force reduced? A.—By moving the MS-40 brake valve handle towards release position.

312—Q.—Does this movement fully release the braking force? A.—No. The brake valve handle must be

placed in release position for full release.

313—Q.—Explain how the straight air pipe pressure is reduced during the operation of the master controller (Fig. 32) to correspond with the reduction of control pipe pressure. A.—When the control pipe pressure in chamber B, acting on the diaphragm 18 of the master controller, is reduced below the straight air pipe pressure in chamber A on the face of the release diaphragm 18a, shaft 32 of the master controller is moved and opens contact lever 41 and the release (Rel.) contact to de-energize the release wire and, therefore, the release magnet of the 21-B magnet valve. Spring 35 then unseats release magnet valve 62 on the 21-B magnet valve, opening the exhaust so that pressure from passage 4a, the straight air pipe and diaphragm chambers of the F 1864 or FS 1864 relay valve, is reduced the same amount that control pipe pressure is reduced.

314—Q.—Explain the movements that bring about a reduction or release of brake cylinder air. A.—As stated, a corresponding reduction is made in the relay valve diaphragm chambers A, K, N or P, whichever is in control. As the pressure is reduced in passages 16, 16a and the check valve chamber, the greater pressure in the controlling diaphragm chamber K, N or P, lifts check valves 51, 51a or 51b and reduces into passage 16. After the pressure is reduced in passage 16a and chamber C below the inshot spring valve, spring 88 returns the inshot piston 84 and diaphragm 85 and opens supply valve 92. As the pressure is removed from the diaphragm side of main diaphragm 38 the higher brake cylinder in chamber F of the relay portion and spring 42 return piston 36, and its lever 43. With pressure removed from exhaust valve 23 and its piston 25, brake cylinder pressure opens them and flows to the atmosphere.

315—Q.—How does this work out when making a graduated release? A.—In making a graduated release, the relay portions of the relay valves will lap and retain brake cylinder pressure in accordance with the lapping action of the master controller so that brake cylinder pressure can be released in small increments to produce

a smooth stop.

Emergency Application

316—Q.—During an emergency application, how is the self lapping portion affected? A.—During an emergency brake application, which is obtained by moving the MS-40 brake valve handle to the extreme right, the self lapping portion immediately produces electro-pneumatic application as described under service brake operation.

A Ratchet Coupling Wrench

Among the special tools used to expedite car work at the Michigan City, Ind., car shops of the Pullman-Standard Car Manufacturing Company is a special head applied to a ratchet wrench and used to apply couplings of the type illustrated in air-brake pipe lines on freight cars. This coupling is an awkward fitting to screw onto



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Ratchet wrench equipped with special head for use in applying couplings in freight-car brake lines

a pipe thread, especially in close quarters under a car, and the use of a dummy half coupling on the ratchet wrench with two studs to engage holes in the coupling which is being applied eliminates danger of pipe wrench slippage, or constantly readjusting the pipe jaw opening, as would be necessary when using a standard pipe wrench for this operation.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Wheel Changes By Terminal Company

Chicago & Illinois Midland (Mather) box car 8181 was received on the Peoria & Pekin Union rails from the C. & I. M. and while the car was in that company's account wheels were changed by the P. & P. U. account of owner's defect and new wheels were applied. A week later while the car was still on the P. & P. U. but was then under load in the New York, Chicago & St. Louis account, the P. & P. U. replaced the new wheels with a pair of second-hand wheels account cut journal. The Mather Stock Car Company contended that the P. & P. U. charge should be confined to second-hand wheels and cited Rule 98, Paragraph (b-8). The railroad contended that the rule did not apply inasmuch as the change in the first instance was made for the account of one road and in the second for the account of another. Between the times of the wheel changes the car had moved over the

lines of the N. Y. C. & St. L. The second wheel change had been billed against that company as a handling line responsibility and the owner had been so notified.

In a decision rendered on November 18, 1944, the Arbitration Committee held that, "Inasmuch as wheels were changed by the Peoria & Pekin Union for two different railroads, Paragraph (b-8) of Rule 98 does not apply. The contention of the car owner is not sustained. The principle of Decision No. 1485 applies." Case 1807, Mather Stock Car Company vs. Peoria & Pekin Union.

Charges for Repairs in Kind

The Seaboard Air Line applied a lever-type end steam valve to a refrigerator car of Pacific Fruit Express Company ownership showing the same type to have been removed because it was broken and basing its charge and credit on the value of material applied and removed. The owner asked verification of the type of valve removed stating that screw-type valves were standard to the car and that there was no record showing the application of a lever-type valve by any other company. The Seaboard was requested to reduce its billing to the value of a screwtype valve. It refused to do this and verified the fact that a lever-type valve had been removed. The owner believed that the principle of the fourth interpretation following Passenger Car Rule 16 was applicable but the railroad did not agree. According to the owner screw-type valves were standard although it had not previously claimed wrong repairs in cases where lever-type valves had been substituted.

The Arbitration Committee ruled on April 12, 1945. that, "Inasmuch as the Seaboard Air Line applied the same type of end steam valve as was removed from the car and the car owner has not furnished satisfactory evidence of type of valve standard to the car, charge and credit should be on the basis of material applied and removed. The contention of the Pacific Fruit Express Company is not sustained." Case 1808, Pacific Fruit Express Company versus Seaboard Air Lines.

Dismantlement Is Choice of Car Owner

Gulf, Mobile & Ohio all-steel box car No. 5663 was extensively damaged by fire on the Chicago, Rock Island & Pacific. Numerous necessary repairs were made to put the car in shape to move home and defect cards for additional damage were attached to the car. The car owner was not advised of the extensive damage done to the car prior to its being shipped home. The contention in the case on the part of the owner was that the car should be settled for on the basis of depreciated value, the car was a little more than year old. The Rock Island insisted that the car could be repaired at a cost less than the depreciated value. Three joint inspections had been made of the car, the first by a representative of the owner and one from a disinterested railroad, the second by a representative of the Rock Island and one from a disinterested road, and the third, a more complete report, by the owner and a representative from a disinterested road. The main points in issue involved the possible safe reuse of many parts which had been subjected to heat from the fire in which the car was damaged. The Rock Island refused to issue additional defect cards covering damaged parts listed in the itemized joint inspection certificate furnished by the car owner. According to the owner the two points at issue on which decision was requested were: (1) Should this car have been reported under Interchange Rule 112 as a destroyed car? and (2) should not the Rock Island issue its defect cards to cover all defects enumerated in the G. M. & O.'s joint inspection certificate, this being a re-

quirement of Interchange Rule 4, Section (k), Para-

graph (1)?

In a decision rendered on April 12, 1945, the Arbitration Committee ruled that, "Decision as to whether a car should be repaired or dismantled rests with the car owner and, on that basis, bill should be rendered under the provisions of Rule 112, if car is repaired, or under the provisions of Rule 94 in effect on date car was damaged if car is dismantled. In either event, bill should be rendered on authority of defect cards issued on basis of joint inspection certificate executed by representatives of owner and the Illinois Central dated November 24, 1943." Case No. 1809, Chicago, Rock Island & Pacific versus Gulf, Mobile & Ohio.

A Simple Cotter-Key Puller

The cotter-key puller here illustrated is in use at the Michigan City, Ind., car shops of the Pullman-Standard Car Manufacturing Company. It consists simply of the



Cotter puller with sliding steel cylindrical handle which saves time and skinned knuckles

usual puller, made with a straight round rod and sliding steel sleeve or handle which slides easily up and down on this rod and is stopped at the lower end by a nut.

In operation, the reduced diameter goose-neck end of the puller is inserted in the eye of the cotter key and a few quick downward strokes of the fairly heavy steel cylindrical handle against the bottom nut serves to pull out the cotter without the necessity of straightening the cotter legs or using a hammer as is usually done on some part of the cotter puller. Time is saved, and what is possibly even more important, skinned knuckles are avoided.

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ELECTRICAL SECTION

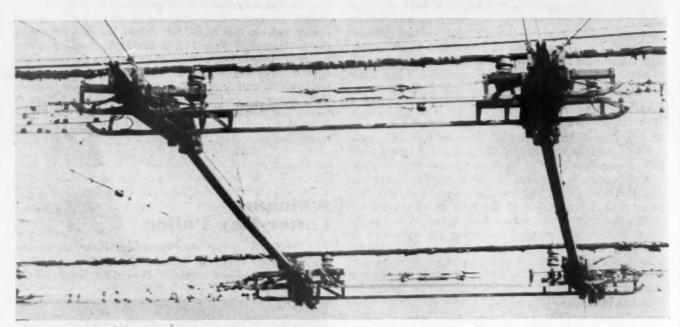


Fig. 1-Original inverted trough type of crossing which required I. C. trains to coast with power off

Two-Voltage Trolley Crossings

Grade crossings of two overhead electric traction lines having different voltages has been made possible with control on (without the need for coasting), by a notably ingenious development on the Illinois Central. The crossings involved in this instance are six which the Illinois Central has with the Chicago Surface Lines. The voltages on the two lines are respectively 1,500 and 600 direct current.

The original type of crossing which required that Illinois Central trains coast over with no power on is shown in Fig. 1. The Surface Line cars, moving in and out of the picture employ a trolley pole with a wheel which moved along the wire to the inverted trough having an offset at either end over the two Illinois Central tracks, and then out of the trough and back onto the wire at the other end of the trough. This required slow operation and frequently resulted in the trolley coming off the wire as it emerged from the trough.

The Illinois Central trains use pantograph collectors and these moved laterally over the crossing as shown in Fig. 1. Insulators in the 1,500-volt contact line on either side of the crossing separated the two power systems and it was necessary for Illinois Central trains to have enough speed to coast over the crossings. The offset in the troughs permitted the pantographs to slide under them without catching, but it involved a roughness of operation which probably increased pantograph maintenance costs.

The new type of crossing which is located at 71st Street and Stony Island is shown in Figs. 2 and 3. The two Surface Line wires move in and out of the picture and the Illinois Central lines across. The four bow-shaped pieces of hardware carry the Surface Line trolleys

Illinois Central develops arrangement which permits freedom of operation by both lines

down to the level of the Illinois Central contact wires and also permit the Illinois Central pantographs to slide by. The four insulators A, B, C, and D, separate the Illinois Central contact wire electrically from the Surface Line wires.

There are also two other insulators in each Illinois Central line approach to the crossing. These are shown as E and F in Fig. 3. Insulator A is shown in both Fig. 2 and Fig. 3.

Trains approaching the crossing from the left in Fig. 3 are just leaving a station and each two-car unit is drawing a maximum of 800 amperes at 1,500 volts from the contact wire. Insulator F is a blow-out insulator and when a pantograph reaches this insulator it slides from a live to a dead section and the resulting arc is blown out. This drops out the line breakers since they are held in by 1,500 volt coils and the pantograph moves across the crossing until it reaches the live 1,500-volt wire on the other side when the line breaker picks up and the unit goes into service again. The motorman may keep his controller on as the train goes over the crossing and each unit drops out and picks up again as it passes.

The section of the Illinois Central wire between in-

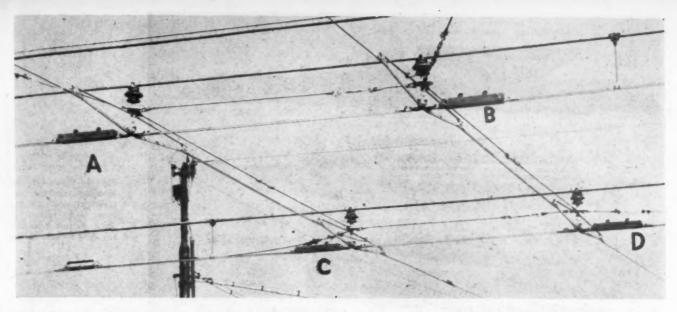


Fig. 2—New type of crossing showing the Chicago Surface Line wires running in and out of the picture and the Illinois Central wires laterally across—The insulators A, B, C and D are in the I. C. wires

sulators A and B Fig. 2, is energized with 600 volts d. c., but since the line breakers have dropped out on the Illinois Central cars as they pass this point, only the auxiliary circuits are connected and the current they draw at 600 volts is negligible.

The insulator E (Fig. 3) affords protection for a possible contingency. If it should happen that an Illinois Central unit should pass the blowout insulator F with both pantographs up, the section of the Illinois Central contact wire between F and the crossing might momentarily be made live. If at the same time, a Sur-

face Line car should go over the crossing with its trolley off and swinging it might strike the Illinois Central wire. The insulator E would then keep the Illinois Central wire dead beyond the reach of the swinging trolley pole.

Blow-Out Insulator

The blow-out insulator shown in Fig. 4 successfully and continuously interrupts 800-amp., 1,500-volt arcs with no visible fireworks.

At the top is shown a side view, No. 2 and No. 4 are top views with and without the Transite arc baffles and

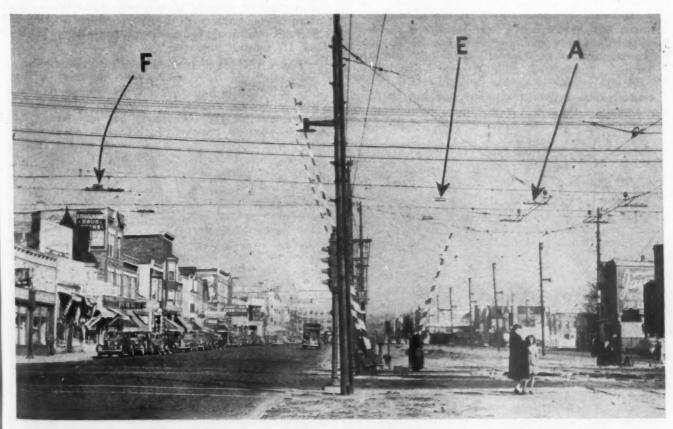


Fig. 3—Approach to the crossing at 71st Street and Stony Island—The blow-out insulator is shown at F, the emergency insulator at E, the insulator A corresponds to the one marked A in Fig. 2

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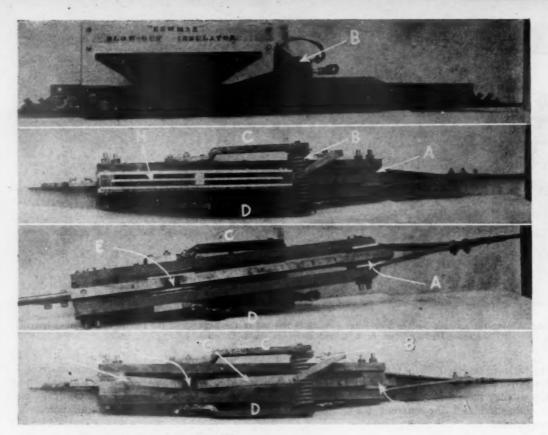


Fig. 4—Views of the blow-out insulator; respectively side view, top view with baffles in place, bottom view and top view without baffles

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No. 3 is a bottom view. As a pantograph approaches the insulator from the right in view No. 3, it passes the insulated point A. The current then travels from the trolley wire through the blowout coil B (views 1, 2 and 3) and back to the pantograph along the center strip in view 3.

This energizes the magnetic circuit which is carried to the gap by the bars C and D (views 2, 3 and 4). When the pantograph reaches the gap E, the circuit is interrupted and the magnetic field blows the arc up through the horns F and G (view 4) and into the baffles H (view 2). These baffles divide the arc both laterally and horizontally. The insulator successfully extinguishes the arc at speeds up to 30 miles an hour, which is the maximum operating speed over these crossings.

In addition to the crossing at 71st Street, there is one at 92nd and Exchange Streets, and another at 121st Street and Michigan Avenue. Three more will be installed.

The work was engineered and installed by C. R. Wadham, assistant engineer, and H. H. Newman, General Foreman, Illinois Central.

Train Telephone Operators Need No Licenses

Railroad employees will not be required to hold operator licenses to operate radio equipment which may be installed by the carriers, according to Order No. 126 issued by the Federal Communications Commission on August 21. The order was an exercise of the commission's authority to waive the licensing provisions of Section 318 of the Communications Act of 1934 in cases where it finds that the public interest, convenience or necessity will thereby be served.

The action, coming in response to a petition from J. J. Pelley, president of the Association of American Railroads, was taken "to facilitate the use of radio for increased efficiency and safety in railroad operations," the commission's announcement said. Mr. Pelley's petition had stated that the number of Class I railroad employees who might be required to use radio transmitting equipment in connection with their duties totals 463,568 and that this total would be increased by inclusion of Class II and III railroad employees.

The A.A.R. has prepared for the adoption of its member roads what the commission's order calls a "comprehensive set" of Railroad Radio General and Operating Rules governing the use of transmitting equipment. In this connection the commission has approved a procedure whereby prospective operators among railroad employees will be examined on these A.A.R. rules by railroad examiners. This will be in lieu of the commission's own examinations.

The order contained several conditions, including a requirement that adjustments to the transmitting apparatus must be made only by duly licensed operators. Another condition limits the order to employees of roads which have adopted the A.A.R. rules, although there is provision for modification by individual roads if they first obtain written approval from the commission. The first examination of a prospective operator must be conducted prior to his operation of any transmitting apparatus, and re-examinations are required at intervals not in excess of two years.

Also the order applies only to roads which "maintain suitable records showing the name and position of all employees who have been examined . . . the date of the employee's last successfully completed examination and the name of the railroad examiner." Finally, the railroads radio equipment "shall be so designed that none of the operations necessary to be performed during normal use of the equipment may result in any unauthorized radiation."

Train Communication Test Car

For the development and testing of train communication equipment, the Chicago, Rock Island & Pacific has installed test equipment, meters and other laboratory apparatus in a car that can be used on passenger trains as well as on freight trains. About a year ago some of this equipment was installed in a caboose, but such a car could not be hauled in fast passenger trains. In order to use the electronic laboratory in any train, either passenger or freight, a test car was equipped with high-speed trucks.

Work Room

The work room, including work benches and testing equipment, occupies the most important portion of this car. A combination office and radio room is located in the other end of the car. A separate small room, with sound-proofing, includes the gasoline-engine-driven generator. A small kitchen and bunks are available which will accommodate up to 12 or 13 men while on long trips. The equipment in the car includes communication apparatus furnished by various manufacturers, including the Galvin Manufacturing Corporation, the Bendix Corporation, Hallicrafters, and Communications Company, Inc., and also some specialized communication equipment developed by the Rock Island. The cathode ray oscillograph was made by Allan B. Dumont, the recording meters by Esterline Angus, the microvolter is from the Ferris Instrument Company, and the smaller portable electrical instruments are Weston. Various special pieces of apparatus were secured from the Sperry Gyroscope Company, the Dictaphone Corporation and others.

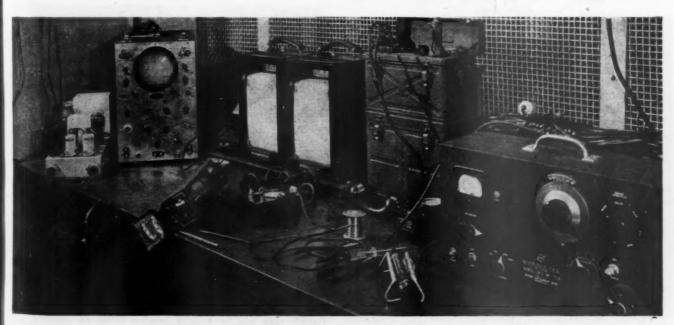
Radio Apparatus

The car has three antenna. One which is on top in the form of a vertical member with four horizontal members beneath it, works with the 160-mc. experimental equipment on which the railroad is doing some research work.

Rock Island develops rolling laboratory which can be hauled in fast passenger trains — Bunks and kitchen for 13 men

At the other end of the car is a long horizontal antenna mounted on insulators which connect to a receiver in the center of the car. This unit covers a range of 28 mc. through 145 mc. for general communications. The receive operates on FM and AM signals. On the end, and opposite the combination radio room-office, and on each side of the car are mounted the vertical steel rods which, when connected in parallel, comprise the antenna for the Motorola FM 30-40 mc. transmitter-receiver which is used for the usual communications with the wayside stations.

The Motorola FM receiver-transmitter in the office section of the car is operable with an ordinary type telephone handset, except that the impedence of the earphone has been changed to match the output of the receiver radio circuit. On the handle of the handset is a push-button which must be depressed to place the transmitter on the air. At the same time this deadens the receiver so that the earphone is non-operating. A loud speaker, located inside the console behind the grille can be used for reception and the earphone cut out. A second handset is located in the laboratory room at the other end of the car. The console can be remotely operated from that position, since under normal conditions no care or observation need be made at the console location during its operation. The unit is used for main communications with the stations on the railroad where similar equip-



The work-bench in the laboratory room of the car

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The Pioneer five-kva. gas-electric Gen-e-Motor used to supply power for the receiver-transmitter



Dictaphone apparatus for recording incoming and outgoing telephone conversations

ment has been or is being installed. The set operates while the car is in motion or stationary.

Primary power is furnished to the set at 115 volts a.c., from a Pioneer Gen-E-Motor 5 kv. gas-electric generator located in the power plant room at the same end of the car as the laboratory.

Laboratory Equipment

The laboratory includes a long work bench—with several drawers. Tools, instruments, meters and trouble-shooting equipment are provided. On another table along the opposite wall is a portable Dictaphone recorder which can be "patched" into any circuit, whether radio or telephone, for permanently maintaining a running log or keeping a record of electronic or traffic observations. A telephone handset placed on the wall and connected to the. Motorola console in the radio room permits its remote operation, and affords contact stations directly from the laboratory room.

Two Motorola handie-talkie sets and two Motorola walkie-talkie sets are kept in a small closet in the laboratory room. These are regular U.S. Army Signal Corps

type, and are used by personnel when they must move away from direct contact with the car, yet maintain communications, especially in emergencies.

To Bridge Pole Line Breaks

Stored in a closet in this car are two self-contained, bridging, portable fixed, radio transmitter-receiver units. Designed by Rock Island and built by Galvin, these trunk-mounted bridging units and their associated automatic ringing devices are employed, when an extensive section of pole line is destroyed by a storm or flood, to maintain contact by combination of telephone or telegraph and radio. The end of the telephone or telegraph wire at the break is fed to one unit, and the message is radioed over the break (up to about 35 miles). It is received with the other radio unit and sent to its destination over the unbroken portion of the telephone or telegraph wires. To accomplish this, both bridging units are capable of "duplex" operation in that they transmit on one frequency and receive on another. The equipment can be powered from the car generator or from the reg-ular 115-volt lines at any station. FM-type emission is used to avoid interference from the usual electric railroad and power line devices, and to give independence of atmospheric and static conditions.

Special Antennae

The bridging units are used with special antenna base supports which enable the crew to install temporary aerials of the vertical rod type, on top of the nearest telegraph pole. A self supporting mast can also be created by pushing the base into the soft earth and mounting the vertical member. A permanently connected coaxial cable of correct length to match the impedance of the antenna to the equipment, is then joined to an outlet plug in the side of the portable trunk, closing the antenna circuit.

Radio installations were begun on Rock Island Lines under C. O. Ellis, superintendent of communications, and E. A. Dahl, electronic engineer, in March, 1944. The entire electronic field laboratory was developed and is under the supervision of Mr. Dahl. The laboratory and radio shop has given excellent service and has more than proven its worth in emergencies.



Portable radio sets for bridging pole-line breaks are mounted in

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General view of the plant showing (left and center) wet sand storage, (right) sand drying building and (background) the two 20-ton sand towers which span the service tracks

Automatic Sand-Handling Plant

THE Erie has installed an entirely automatic sandhandling plant as a part of its Diesel-electric servicing facilities at Marion, Ohio. The automatic features are made possible by the use of electrical devices including photo-electric relays, pressure switches, electric vibrators, hopper level switches, etc.

A general view of the plant is shown in the largest photograph. In the center is a 70-ton wet storage bin which is loaded with a clam-shell crane through roof doors. At the left is a larger, open-top storage bin. At the right is the sand-drying building, and in the background are the two 20-ton dry-sand towers on structures

which span the servicing track.

The sand in the wet storage bin is fed by gravity into chutes at the bottom of the bin. Directly under the chutes is a horizontal belt sand conveyor, 14 ft. long, driven by a three-hp. motor. The wet sand falls from one end of the horizontal conveyor onto a fast-moving inclined flight belt conveyor which carries the sand into an eight-ton storage hopper directly over two steam sand driers. The conveyor which is 40 ft. long is inclined at 30 deg. with the horizontal and is driven by a five-hp. motor. The conveyor motors are started by a push-button and are stopped automatically when the sand contacts a mercury-tube pendulum-type switch.

The steam coils under the eight-ton storage hopper are shown in the drawing. They are supplied with steam continuously and the condensate is used for locomotive cooling water and heating boilers. In the original design

Electrical controls eliminate all manual operations between the wet-sand storage bin and the dry-sand discharge pipes

of the plant controls were included which shut off the steam when the demand for dry sand had been filled, but these were not included since wet sand would seep into the dry sand during off periods and very little steam is used when there is no sand movement since the water in the sand around the pipes has been removed and the sand itself provides effective heat insulation.

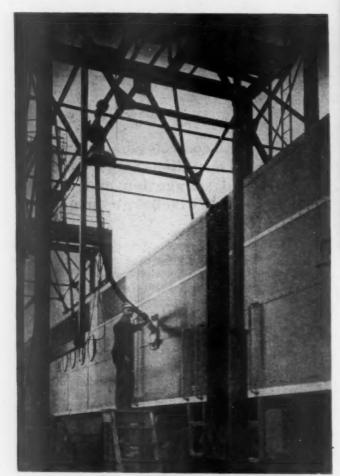
Sand from the drier falls by gravity as it is dried through two inclined vibrating screens into two cylindrical dry-sand elevating tanks, each holding 20 cu. ft. of sand per charge. Sand as needed is elevated by compressed air to the two 20-ton sand towers which span the service tracks and from which sand is fed into the locomotive sand boxes by gravity.

Photo-Electric and Pressure Switch Control

A feature of the elevating tank is its photo-electric control. At one side of each elevating tank is a by-pass or gauge pipe near the center of which are two glass windows or bull's-eyes. A light source opposite one of



The service track is shown at the left and the sand drier and storage bins at the right



A locomotive receives sand at the service track—Filling nozzles are arranged to supply all of the sand tanks on two units at one spotting of the locomotive—all of the fuel tanks can be filled from a single locomotive position.

the bull-eyes shines through the pipe to a photo-electric relay when the pipe is empty. Under this condition the solenoid valve on the air line is closed.

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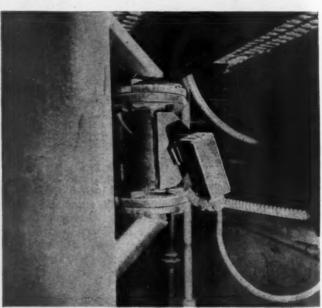
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The sand from the drier drains into the tank and when the tank is full, sand runs into the upper end of gauge pipe and blocks off the light passing through the bull'seyes. This causes the photo-electric relay to function and this, in turn, opens the air valves and shuts down the screen vibrators.

Sand Elevated By Compressed Air

Air pressure in the tank first closes the plug valve through which the dry sand runs into the tank and then starts to discharge sand into the dry-sand tower. It requires 3½ min. to empty each drum.

When the elevating tank is empty, sand runs out of the gauge pipe, again exposing the photo-electric relay. In order to insure the complete emptying of the elevating tank and conveyor pipes at the end of each operation, there is installed a reverse operation pressure switch (52) set to close its contacts at about 25 lb. air pressure. These contacts shunt the contact made by the photoelectric relay and keeps air feeding into the elevating tank even after the sand has cleared out of the space



The photo-electric relay and light source are located on opposite sides of the elevating tank gauge pipe. When the tank is full, sand runs into the top of the gauge pipe filling the pipe and shutting off the light—when the tank is empty, sand runs out of the gauge pipe and exposes the relay to the light source

between the bull's eyes. As soon as all the sand is blown out of the conveyor pipes the air pressure falls rapidly in the elevating tank due to the large outlet in the tank and the air line being comparatively small, allowing the pressure switch to open and the solenoid valve closes shutting off the air. This cycle is repeated until the level of the sand in the sand tower is sufficient to open the upper hopper level switch, 58. The operation of the elevating tank is then discontinued until the level of the sand in the tower is low enough to allow both bin level switches to close.

With no demand for sand from the dry sand tower, the sand from the drier fills the elevating tank and stops automatically because there is no place for it to go.

Each sand tower has four outlets permitting the servicing of the eight boxes on two locomotive units from one position of the locomotive.

The electronic features of the sanding facilities were designed and installed under the direction of C. F. McKinney, supervisor of tools and machinery, and G. E. McKinney, electrical engineer, Erie.

Control and wiring diagram for sand drying and elevating system

(58)

110 Volt Supply

(56)

Sand

Discharge Pipe

(59)

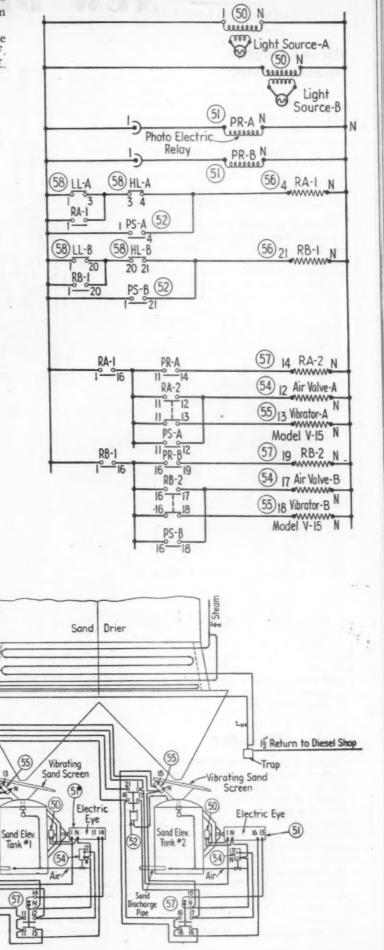
20 Ton Capacity Sand Tower #2 East

Steam Coil

- 50—General Electric general-purpose photo-electric relay
- 52—Diaphragm pressure switch for reverse operation
 54—E. C. Atkins & Company automatic valve, size ¾ in., 100 ib. air, normally closed
- Syntron pulsating magnetic vi-brator
- 56-General Electric a.e. magnetic
- 57—General Electric a.c. magnetic switch
- Syntron hopper level switch on top, normally closed
- 59—Westinghouse no · fuse circuit breaker

20 Ton Capacity Sand Tower *I West

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NEW DEVICES

Diesel Engine Nozzle Tester

A portable unit designed for testing Diesel engine nozzles and injectors has recently been introduced by the Buda Company, Harvey, Ill. The device functions so that any mechanic or Diesel-engine operator can measure injector opening pressures with it, determine accurate adjustment, check spray pattern for uniformity, and detect other irregularities such as sticking needle valves, dribble and leakage around valve seats.

The Buda universal Diesel nozzle tester is equipped with a standard hydraulic pressure gauge, with a 3½/16-in. dial. Gauge capacity is 3,000 lb. per sq. in. and the dial has 100-lb. gradations. Gauges of 5,000 and 7,500 lb. capacity are also available.

Completely portable, the tester weighs



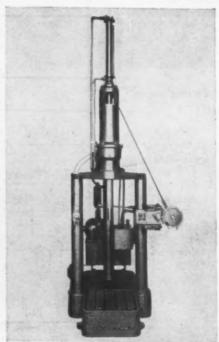
Universal Diesel-engine nozzle and injector tester

less than 19½ lb., including an all-steel carrying case, one adapter and a removable 12-in. steel handle. The carrying case is 55% in. by 7½ in. by 11½ in. in size and holds such extras as adapter fittings, a special cradle, a popping device, extra pressure gauges, risers, a spray pan, high-pressure lines, fittings, etc.

Honing Machine

A honing machine, manufactured by the C. Allen Fulmer Company, 1237 First National Bank Building, Cincinnati 2, Ohio, is capable of honing cylinders of all diameters encountered in railroad operation. Among them are Diesel liners, gas-engine, air-pump, air-brake, stoker, reverse-gear, piston-valve and many other types of cylinders. It has been designed for heavy loads, continuous operation, and to deliver maximum torque into the spindle for fast stock removal. Spindle, gears and bearings are rugged and of large capacity for severe operation.

The machine can be supplied in various



Honing machine designed for heavy work

sizes with working strokes from 25 in. to 72 in., and with cylinder honing capacities up to 20 in. in bore. All the controls have been brought down to floor level by the use of a patented control system, and are located within easy reach of the operator at the front of the machine.

Spindle and shafts are of ample size, properly heat treated and mounted on oversize or roller or ball bearings, all operating in a bath of oil, which are adequately protected from dust and grit.

An ample supply of coolant is carried in the base of the machine and this passes through multiple settling chambers before being repumped to the work. A sump system permits cleaning the solid matter in the coolant system quickly without loss of coolant or productive time. For precise control and smooth operation, the entire reciprocating mass is hydraulically counterbalanced at all times.

The reciprocating spindle can be hydraulically stopped at any point within the stroke capacity of the machine without shock or impact to the machine or work. The spindle is locked in at such a stopping point and can be held there before upward movement, in definite second increments that are electrically timed. This timing range covers from one second to thirty seconds and the time is not affected by variations in oil temperature or viscosity, as would be the case with timing controlled by the hydraulic oil passing through an orifice of various sizes. When reciprocation is stopped, there is no pressure in the hydraulic pump line and the reciprocating mass is hydraulically sustained at that point in the stroke range. There is no over-run of the spindle at the top or bottom of the stroke at whatever reciprocating speed for

which the machine may be set. This makes the machine very useful for honing blindend cylinders, or up to an internal shoulder. There is no guess work on the setting of the controls, as they can always be re-set to obtain the same result, when a changeover of work is desired. Fo A eng

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Crane Hoist Drive

A hoist drive for cranes, known as the Maxspeed system, has been announced by the Industrial Engineering Division of the General Electric Company. The drive, which automatically "measures" the load so that it is hoisted and lowered at the maximum safe speed and yet prevents the handling of dangerous overloads. It is designed for use on either indoor overhead, slow-speed cranes, or high-speed cranes of the type used in outdoor construction where accurate hoisting and lowering operation is of utmost importance.

The drive operates from either a.c. or d.c. incoming power. If used with a.c., the drive consists of a generator, a cross-flux exciter and an ordinary constant-voltage exciter, all driven by an induction motor, and a d.c. hoist motor similar to the type used in crane-hoist installations except that



The drive has inherent speed control and can be used either for high-speed outdoor or low-speed indoor cranes

its main field is designed for a variable separate excitation. If used with d.c., a shunt-wound d.c. motor drives the generator and the cross-flux exciter instead of an induction motor, and the constant-voltage exciter may be eliminated.

In operation, heavy loads are both hoisted and lowered at slow speeds, and light loads or the empty hook are hoisted and lowered at high speeds. Intermediate loads are handled at intermediate speeds, depending on the weight of the load. These speed changes are inherent in the drive and do not depend on the functioning of the control devices. All braking is accomplished electrically, the power being returned to the supply system instead of being dissipated in resistors. A solenoid brake holds the load when at rest.

Compression Tester For Diesel Engines

A portable instrument for checking Dieselengine compression and firing pressures which has only one moving part has been developed by Kiene Diesel Accessories, Incorporated, 380 Lexington Avenue, New York 17, to answer the need for an easy method of making cylinder pressure tests. Operating instructions furnished with the



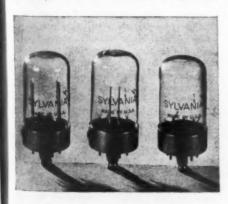
Compression checker for Diesel engines

instrument read, "Blow cock on working cylinder and attach indicator. Then open cock and read pressure on the high quality hydraulic gauge that is furnished with the instruments."

The device is equipped with a tapered plug and wing nut connector adaptable to standard indicator cocks. The reading on the gauge, when the device is connected to a cylinder, holds its indication until it is released by the oeprator. Frequent use of the indicator is a means of detecting minor abnormalities in operating conditions of a cylinder. It is not affected by heat and no complicated adjustments either before or during use.

Power Measurement Lamps

Simple, direct measurement of the power output of electronic and radio communication equipments at frequencies up to 900 mc. can be made by six types of power-measurement lamps developed by Sylvania



Three of six types of power measurement lamps for measuring high frequency radio power output

Electric Products, Inc., Emporium, Pa. Built with two identical small filaments and mounted in lock-in type bases these lamps measure power outputs ranging between 0.05 and 25 watts with accuracies within five per cent or less, depending on the type of reading taken.

Power-output measurements are made by connecting one filament to the highfrequency output and the other to an a.c. or d.c. source. Voltage of the second filament is regulated until both filaments are equally bright. Power is determined by meter readings in the a.c. or d.c. circuit with equal power dissipated by the filament in the high-frequency circuit. Increased accuracy may be obtained by reversing the filament circuits and averaging results.

Journal-Box Lid Is Sealed Against Dirt

The National Malleable and Steel Castings Company, Cleveland 6, Ohio, has designed a journal-box lid with a dirt-deflecting strip,

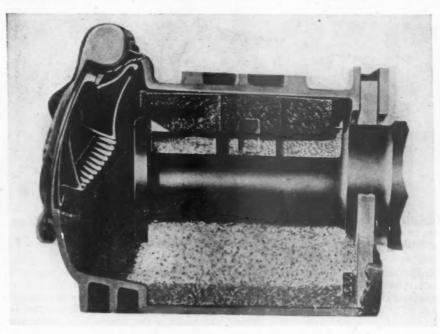
25-Cycle Fluorescent Lighting

Electronic Laboratories, Indianapolis, Ind., has announced a flickerless fluorescent lighting system to be used on 25-cycle electric current. A conversion unit makes its use possible in areas where power is supplied at this frequency.

Twenty-five-cycle current gives a pronounced flicker in fluorescent lighting, and the conversion unit uses a rectifier tube and a voltage-doubler circuit to eliminate the flicker.

Locomotive Injector

The Edna Brass Company, Cincinnati 2, Ohio, has introduced a series of single-lever-operated injectors for locomotive use, which have capacities up to 15,000 gal. per hr. Known as the Type-J injectors, the three models in the series will grade from a maximum to a minimum of 65 per cent of rated capacity efficiently, without loss



Journal box arrangement showing tight-seal lid

included as an integral feature. The lid is circular instead of square so that the lid face and the box mouth can both be machined if it is desired. About the edge of the box mouth is an upstanding flange, overlapping the edge of the lid, so that the lid, when closed, is recessed into the box. This, together with accurately fitted lid and box faces, provides for the exclusion of dirt and water under all conditions of weather and speed. The lid mechanism is of the National No. 3 coiled-spring type, in which the lid is pulled inward directly against the box mouth. The lid operating parts are all inside the box where they are continually lubricated. The lid and hinge lug are so designed that the lid is locked securely to the box without the use of a hinge pin. To remove or apply the lid a wedge is driven between it and the spring lever, no special tools being required.

of water or steam. They will pick up feedwater having a temperature of 140 deg. F. and deliver water to the boiler at 300 deg. F. They will completely drain a tender and restart themselves if the steam or water supply is interrupted momentarily.

The single-lever mechanism permits maximum grading and ease of operation and makes positive the opening and closing of the water and steam valves at all times. The water valve always opens before the steam valve. The overflow arrangement on these injectors is fully automatic, but they are so arranged that they can be furnished with a combination automatic-manual control. If the single-lever control is not desired the injectors can be supplied equipped with a double-post cab stand, which permits manual control of the steam and water valves.

These injectors may be applied without

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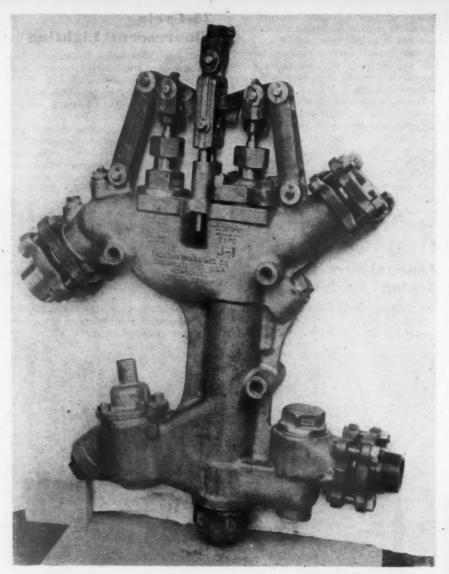
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Single-lever-operated injector with a capacity of 15,000 gal. per hr. delivery at 300 deg. F.

change on either the right- or left-hand side of the locomotive. The cab lever is universal and can be used for either mounting. The delivery-line check is built into the injector, but is readily accessible. Neither the injector nor the cab lever interfere with clear vision for the engineman. Provision is made for a connection for an alarm valve if the use of one is desired.

Cathodic
Protection Rectifiers

Cathodic protection rectifiers, designed to reduce to a minimum the galvanic corrosion of underground metal structures, have been developed by Federal Telephone and Radio Corporation, Newark, N. J.

Buried structures, such as metal tanks, pipe-lines, well casings, lead-sheathed cables, conduits and similar installations are subject to chemical action between the metal and materials in the surrounding soil, capable of producing an electric current at the surface of the metal and causing galvanic corrosion, which will ultimately result in the destruction of the metal. The

rectifiers counteract this current flow by introducing a potential between the structure and the soil in a direction opposing the galvanic current flow. A selenium rectifier contained in the unit converts standard alternating current power to continuous direct-current power.

The unit contains no moving parts and is effective over wide temperature ranges. It has small standby losses and is immune to momentary high overloads. A center-



The rectifiers are designed to protect buried metal structures from corrosion

contact method of construction is said to further insure reliability.

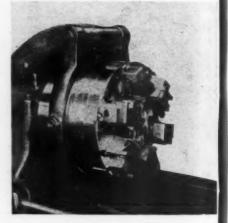
Suitable for installation indoors or out, either on a wall or pole, the rectifier is contained in a weather-proof sheet-metal cabinet with drip-proof hood and hinged cover affording easy access to the control panel. Taps and links permit ready adjustment of the d.c. output which is indicated by an ammeter mounted on the control panel.

It is designed for operation on 230-volt, 60-cycle, 3-phase power lines, to provide d.c. outputs up to 20 amp., from 10 to 40 volts, continuous duty. The complete unit weighs 150 lb., and is 23 in. high by 25% in. wide by 19¼ in. deep.

Die Head

The Landis Machine Company, Waynesboro, Pa., has as one of its postwar products the Lanco 4-in. semireceding six-chaser die head. It will have a capacity from 2½-in. to 4-in. pipe size, this range being covered by chaser holders mounted on slides of heavy cross section to assure maximum rigidity. The chaser holder slides are gibbed to the head body to provide compensation for wear. The interlocking design of the holder and slide assures a rigid clamping action of the two mating parts, with only one clamping screw

The head employs the Lanrac chaser which provides an accurate and rapid



A six-chaser die head

method of interchanging and setting the chasers. This six-chaser die head is of the internal tripped type, in which a sixblade, insert-blade type reamer, located within the bore of the head, reams and chamfers the pipe during the threading operation and opens the head at any predetermined thread length. The semireceding action on the head eliminates the possibility of any chaser leave-off marks on the thread as the head opens up. The reamer is adjustable by an adjusting and clamping rod which extends through the machine spindle. Any desired thread length can be obtained by merely releasing the locking rod and turning the adjusting rod right hand or left hand to increase or decrease the thread length. Any thread length within the thread-length standards for 21/2in. to 4-in. pipe size is obtainable.

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All parts of the Lanco six-chaser head are made from either high-carbon or special alloy steel, depending upon their function and are heat treated or case carburized and precision ground to assure maximum accuracy and long wearing quality. The head has remarkably few operating parts. All parts of this die head are thoroughly protected against wear. Zerk-type fittings provide a means of forcing heavy grease into the chaser slides and other operating parts for lubricating purposes and also to act as a seal to prevent entry of fine cuttings and dirt to assure maximum life.

While the die head is designed primarily to operate as an internally tripped unit, it can be opened and closed externally by means of an operating yoke.

Steam Drive Has

Automatic Discharge

The carry-over of water and solids with the

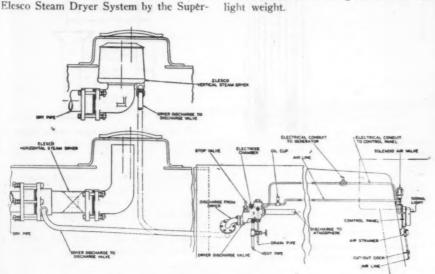
steam in locomotive operation is discharged

by an automatic valve introduced into the



Maximum barn off on electrodes is possible with this holder

holder jaw. An extension of the holder itself allows the now usable stub end of the rod to be projected into the proper position for welding. The holder is completely insulated and loads and unloads in a second. Operator fatigue is said to be reduced because of its good balance and light weight.



Arrangement of automatic discharge valve in steam dryer system

heater Company, New York 17. Tests of Precision Tachometer applications have disclosed that a heavy carry-over of water, which would other-wise have entered the superheater, is ejected to the ground. Normal steam temperatures are maintained with protection to superheater units, throttle valves, valve and cylinder rings. The valve is automatic in operation.

James G. Biddle Co., Philadelphia, Pa., has announced a precision direct-indicating hand tachometer having two scales and five different ranges: 45 to 180, 150 to 600, 450 to 1,800, 1,500 to 6,000, and 4,500 to 18,000

Change of range is made by rotation of a knurled barrel head. The instrument is

supplied complete with carrying case and accessories, including a six-inch circumference wheel for measuring surface speeds.

Magnetic Straight Edge

Flame-cutting of vertical and overhead as well as horizontal surfaces, is said to be greatly facilitated by the use of magnetic straight edges, according to the manufacturers, The B & W Company, 7610 So.



Flame-cutting a vertical surface using a magnetic straight-edge guide

Figueroa street, Los Angeles 13, Calif. An 18-lb. pull holds the B & W magnetic straight edge firmly to the work even if the plate is rusted, oily or painted. Alnico magnets, which are not affected by electricity, are said to last for years.

Uniformly clean and accurate cuts are obtained because the torch tip is held at the correct distance from the work. The straight edges are easily adjustable to any bevel angle. Bevels are cut in one operation. Made of a specially heat-treated aluminum alloy, rigid as well as light in weight, the straight edges do not warp from heat and are resistant to corrosion. Three models are offered in lengths from 18 to 36 in.

Electrode Holder

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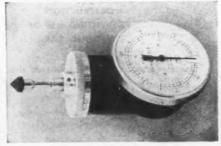
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An electrode holder, designed to allow unobstructed visibility while welding and maximum accessibility even for deep pocket work, fast loading and reloading, and a more complete using up of electrodes has been announced by the Hollup Corporation of Chicago, a division of the National Cylinder Gas Company. Electrodes can be used to a point right up to the uncoated end of the rod. Only one-half inch is needed for a tight, efficient current contact in the



The tachometer has two scales and five ranges

Voltage Control-Relay for A.C. Welders

The Pullman-Standard Car Manufacturing Company, Chicago, has announced a safety panel for eliminating the hazard of high, open-circuit voltages on a.c. weld-The device functions so that when welding contact is broken, it automatically reduces the open-circuit voltage on the electrode from 110 to 24. The manufacturer states that not only does the panel eliminate the hazard but also contributes materially to the ease of mind of the operator. The control panels have been installed in all of the Pullman-Standard plants and are available to other manufacturers through an arrangement with the Square D Company, Detroit, Mich.

Self-Leveling Sling

The Hercules Sling Company, Rockford, Ill., has introduced a complete line of Safe-T-Lift automatically equalizing chain slings made in 4-ton, 7-ton, 14-ton, 25-ton and

40-ton capacities. Recent tests of the 7-ton sling by Robert W. Hunt Co. showed the newly developed chain sling to have a safety factor of 4¼, or a capacity to carry 4¼ times the nominal design load.

Operation of the Safe-T-Lift sling is simple. The block or chain equalizer unit is placed on the crane hook and the crane operator spots the hook over the approximate center of gravity of the load. Floormen then attach the sling's chain legs to the load.

Power to lift the load is applied by the crane operator, and as the crane hook rises

the sling's chain automatically adjusts itself weight of the load pulls on the chain, the sheave in the equalizing unit pulls down against a brake, preventing slippage. Level lifting of the load is assured.

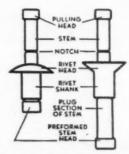
If the crane operator does not get the crane hook and equalizing unit close enough to the load's center of gravity, the load is lowered enough to relieve tension on the sling and release the brake. The crane hook is then moved over to the true center of gravity, and when power is applied the chain readjusts for level lifting.

Pulley Mounting Spring 3/2 Anote

Details of construction of the 14-ton Safe-T-Lift automatic-equalizing chain sling illustrated below which is used in the level carrying of an unbalanced 13-ton Diesel engine at a railroad repair shop

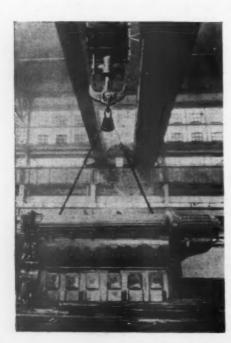
One-Man Riveting

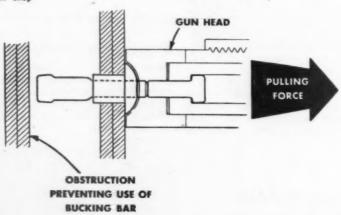
Originally designed to solve the problem of riveting in blind locations where it was not possible to buck up an ordinary rivet, the Cherry rivet, manufactured by the Cherry Rivet Company, Los Angeles, Calif.,



Left: A regular hollow-type rivet—Right: A self-plugging rivet

has been found to have a wide range of uses in other applications. Briefly described, the rivet consists of an assembly of two parts, a hollow member and a stem. The action of a special riveting gun pulls the stem into a blind head and completes the rivet installation. These rivets are





One man can apply this special-type rivet intended for use where a bucking bar cannot be employed

through the Safe-T-Lift equalizing unit. The unit consists of a sturdy steel block and a floating sheave specially constructed to fit the steel alloy chain.

When loads are lifted, one chain leg becomes longer than the other and as the

available in a variety of types, diameters, grip lengths and alloys, intended to meet practically any industrial application where their use is indicated. They may be used on a wide range of pliable and brittle materials, as well as on all sheet metals.

o make a good wheel Better



AMCCW members 1945

- **American Car & Foundry** Company
- Canadian Car & Foundry Company, Ltd.
- Cleveland Production Company
- Griffin Wheel Company
- Marshall Car Wheel & **Foundry Company**

- Maryland Car Wheel Company
- Mt. Vernon Car Manufacturing Company
- New York Car Wheel Company
- Pullman-Standard Car Manufacturing Com-
- Southern Wheel Division, American Brake Shoe Company
- The Tredegar Company

... they spend their time and money

his list of AMCCW members should interest every progressive railroad man. One good reason: it's a rolleall of firms giving top priority to the interests of the railroad industry.

Seeking without pause to make a good chilled car wheel better . . . spending long careful man-hours in protective testing . . . allocating dollars without stint to laboratory maintenance, these member companies unhesitatingly place service and improved product first.

It is a condition of good AMCCW standing that such policies command strict adherence. That is why the work of Association inspectors gets every cooperation from every member . . . why Association research and new product development work gets firm support all down the membership line. In the long run, it may well

prove to be a sound reason why wartime peaks in freight car performance are establishing all-time records, when needed most.

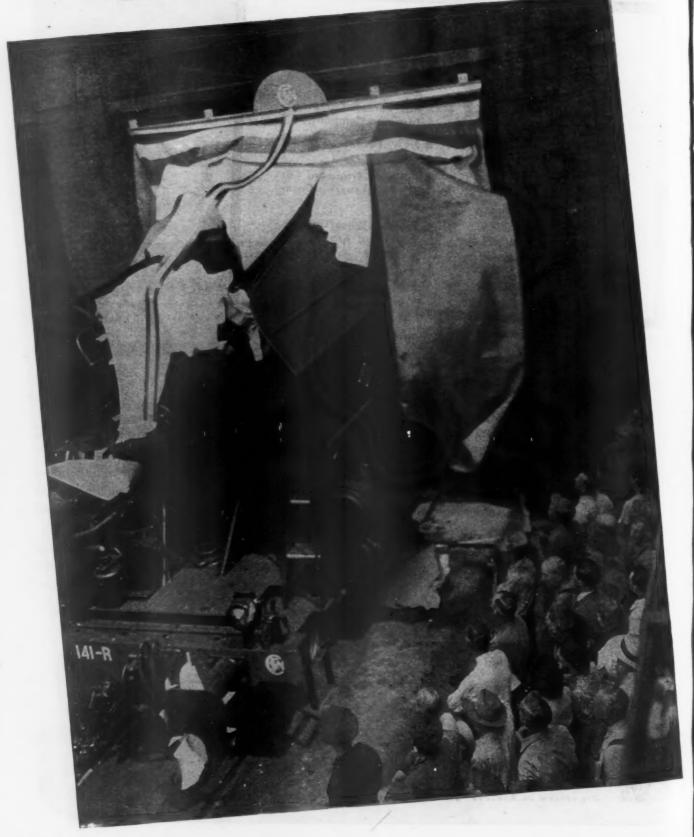


SOCIATION OF MANUFACTURERS OF CHILLED

To Achiever Walform Specifications - Uniform Inspection - Uniform



TO SPEED THE



76

RAILWAY MECHANICAL ENGINEER

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RECOVERY OF FRANCE

LIMA DELIVERS THE FIRST OF 700 STEAM LOCOMOTIVES BEING BUILT IN AMERICA

In the war wreckage of the French railways five out of six of her locomotives were destroyed, and to restore normal life in France her transportation system must be rehabilitated as quickly as possible.

America has been called upon to meet the desperate need for motive power and seven hundred 2-8-2 steam locomotives have been ordered here, of which 180 are being built by Lima.

Realizing the vital importance to France of these locomotives, Lima is meeting the emergency by building its



share in record time. The first of any of the seven hundred to be completed was turned over to representatives of the French Supply Mission on July 31, after being christened the "Liberation" at a ceremony at the Lima Works.

LIMA LOCOMOTIVE WORKS



INCORPORATED, LIMA, OHIO

NEWS

An "Atomic" Locomotive?

RALPH LUCAS of the United States Industrial Research & Development Co., of Elmira, N. Y., on September 11, told reporters for the daily newspapers at Newark, N. J., that laboratory tests he had made had succeeded in releasing atomic energy from mercury in a manner adaptable for use as a source of energy for locomotive propulsion; and that the New York Central had expressed an interest in his experiments. He added that he expected to have N. Y. C. cooperation, enabling him to install his mechanism in a locomotive of that company for test purposes.

The railroad has neither confirmed nor denied this report, declining at this time to make a statement of its negotiations with

Mr. Lucas, if any.

Orders for New Equipment on Books as of August 1

Freight Cars—As of August 1 there was a backlog of 34,797 freight cars on order and undelivered for domestic service. Of these, 32,682 were ordered by 51 railroads, 1,815 by private car lines and industrial companies, and 300 by government agencies. Railroad orders comprised 20,340 box, 5,332 hopper, 5,738 gondola, 850 flat, 89 dump, 50 pulpwood, three refrigerator and 280 caboose cars. The total orders were allocated 25,113 to contract car builders and 9,684 to company shops.

Passenger-Train Cars-As of August 1, 1945, there was a backlog of 1,155 passenger-train cars on order for domestic railroads, which number was almost equal to four years' average production during the twelve years preceding the war, 1930-41, inclusive. Deliveries on these cars were scheduled to begin in August. Included were 696 coaches, 8 multiple-unit coaches, 45 coach combinations, 18 club-parlorlounge-observation cars, 38 baggage-express, 129 sleeping, 126 dining, 51 postal cars, and 43 additional cars, the types of which are unknown. Excepting 10 cars for the Long Island and 90 for the Pennsylvania ordered from the latter's shops, the remaining 1,055 cars are scheduled for building in contract shops.

Thirty-six Hour Week Asked by Shop Craft Unions

*The seven railway shop craft unions have announced that they will seek a sixhour day, six-weekday work week from the railways with no reduction in pay, according to a statement by William Jewell, president of the Railway Employees Department of the American Federation of Labor. The decision to seek a shorter work week was reached after a three-day conference of general chairmen, meeting in Chicago on September 12, 13 and 14.

Mr. Jewell said that the railroads "will be requested to agree to establish a six-hour day, six week-days a calendar week, without reduction in present straight-time

weekly compensation, instead of the present eight-hour day, six week days a calendar week." He stated that no changes in working rules would be sought other than those needed to make the requested shorter workweek effective.

The seven co-operating unions will file formal notice upon the carriers on September 25, according to Mr. Jewell, who added that a detailed public statement explaining the reasons for the request would be issued shortly. The group, of which he is president, represents 400,000 railway employees and has contracts on all of the nation's major rail carriers except the Pennsylvania and Western Maryland, he said.

The organizations filing the demand are: The International Association of Machinists; the International Brotherhood of Boilermakers; Iron Shipbuilders and Helpers of America; the International Brotherhood of Blacksmith, Drop Forgers and Helpers; the Sheet Metal Workers International Association; the International Brotherhood of Electrical Workers; the Brotherhood of Railway Carmen of America and the International Brotherhood of Firemen, Oilers, Helpers, Roundhouse and Railway Shop Laborers.

Railroads Now Have 3,202 Diesel Locomotives in Service

According to statistics compiled by the Railway Age, there were 3,202 Diesel locomotives in service on domestic railways as of June 30, 1945, including 2,791 owned by Class I railways (excluding terminal and switching companies) and 411 owned by terminal and switching companies and Class II and III roads. Class I roads were operating 642 Diesel road locomotives having a total of 2,047,590 hp. and 2,149 switchers with a total of 1,725,038 hp.

There were 271 Diesel locomotives installed during the first six months of 1945, including 25 5,400-hp., five 4,050-hp. and 21 2,700-hp. freight locomotives; 81 2,000-hp. passenger and combination passenger and freight locomotives and 139 switchers averaging 824 hp. The distribution by horse-power of Diesel locomotives on Class I railroads as of June 30, 1945, is shown in

the accompanying table.

B. & O. Orders Radio-Telephone for New Castle, Pa., Yard

An order for radio-telephone equipment, believed to be the first from any railroad for equipment of very-high frequency, has been placed with the Bendix Radio division of the Bendix Aviation Corporation, by the Baltimore & Ohio for use in its yard at New Castle, Pa. It will facilitate the operation of the freight classification yard at that point.

The B. & O. first tested low-frequency radio-telephone equipment in 1928, and in July of last year, in cooperation with Bendix, made its first test of high-frequency radio telephone equipment in its Baltimore terminals. At that time, A. S. Hunt, now chief engineer of communications and signals, reported the test was so satisfactory he expected to arrange for a permanent installation as soon as conditions permitted.

The equipment to be installed at New Castle will consist of a fixed radio transmitter and receiver, and of mobile transmitter receiving units installed on switching engines, and will have three main control points so the yard office may be in constant radio communication with the crews in charge of engines switching the trains. This, it is said, will not only expedite switching under normal conditions but will also be of special value when the weather is adverse and hand signals are not easily visible. The transmitters will broadcast under specific wave length in the 156-162 megacycle range under license issued by the Federal Communications Com-

It is expected the installation at New Castle may further prove the practicability of radio-telephone for railroad use, and that gradually it will be expanded for use on moving trains in main-line service.

New Shop Projects

New York, New Haven & Hartford.— The Federal district court at New Haven, Conn., has approved the expenditure of \$675,000 for the construction and equipping of a new Diesel locomotive maintenance (Continued on next left-hand page)

Diesel Locomotives in Service on Class I Railways-June 30, 1945

	Freigh	t locomotives	pa		nger and comb. d frt. locomotive		17-
Horsepower 5,400	No. 216 6	Total hp. 1,166,400 24,300 67,500		No. 11 1 2 10	Total hp. 59,400 4,050 7,200 27,000	no. locomotives 227 7 2 35	Hp., total 1,225,800 28,350 7,200 94,500
2,000 1,800 1,200 1,000 380 Under 380	 8 8 2	8,000 3,046 500		301 31 7 14	602,000 55,800 8,400 14,000	301 31 7 22 8 2	602,000 55,800 8,400 22,000 3,040 500
Total road locos	265 (Aver	1,269,740 rage 803 hp.	per 1	377 locomo	777,850 tive)	642 2,149	2,047,590 1,725,038
Total rd. and sw. locos						2,791	3,772,628

Note:—411 Diesel locomotives of 286,660 total horsepower are estimated to be in service on switching and terminal companies and on Class II and III railroads.

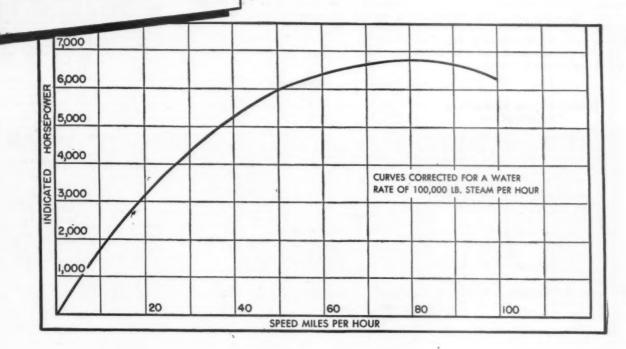
6552 INDICATED HORSEPOWER

The Franklin System of Steam Distribution

applied to

The Pennsylvania Railroad's

T-1 Locomotives



Ralph P. Johnson, Chief Engineer of the Baldwin Locomotive Works says:

"The maximum indicated horsepower of the T-I locomotive is 40 percent higher than that of any locomotive previously tested at Altoona. The graph shows the maximum indicated horsepower of the T-I locomotive at various speeds, based on a steam supply of 100,000 pounds per hour."

From paper read before the New York Railroad Club on May 17, 1945.



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FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK . CHICAGO

In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

shop for the New Haven at New Haven, Conn. The road needs a centrally located Diesel shop to supplement repair and maintenance shops at Boston, Mass., and New York and to care for the large number of Diesel units operated in the New Haven area. The new shop will handle periodical inspection and maintenance of Diesel switchers, as well as running repair work on road locomotives. Special features will include an overhead traveling crane, full length inspection pits, high speed locomotive jacks, a drop table, and an overhead inspection platform. Small individual shops for the repair of electrical air brake, and signal equipment will complement the main shop. Modern locker room and washroom facilities will be provided.

Pere Marquette.-The Pere Marquette has awarded a contract, amounting to \$90,000 to L. D. Strandberg & Son, Chicago, for the construction of a two-stall Diesel enginehouse at Chicago.

Susquehanna Completes Dieselization

THE New York, Susquehanna & Western has received delivery of the last of a fleet of 16 1,000-hp. Diesel-electric locomotives built by the American Locomotive Company and the General Electric Company. These 16 Diesel units replace 32 steam locomotives and effect complete Dieselization of the

Based on actual costs in 1944, conversion to all Diesel-electric operation is reported

to be producing savings at the rate of more than \$400,000 a year. Maintenance and depreciation on 75 coal cars no longer required and maintenance of way and structures expenses, allowing for new Diesel-electric facilities, have been reduced to effect a saving of approximately \$19,000 a year. The operating cost of the new units on passenger runs is reported to be 49 cents per locomotive-mile as compared to \$1 per locomotive-mile for the steam engines. In addition, in 1945 the 16 units will handle an estimated 113,000,000 freight-ton-miles at an operating cost of 60 cents per locomotivemile against \$1.14 per locomotive-mile for the steam engines. Performing 6,575 hours of yard service annually, the Diesels are reported to be saving more than \$20,000 a year over the operating cost of the steam engines in this service.

Directory

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad

ALLIED RAILWAY SUPPLY ASSOCIATION.—J. F. Gettrust, P. O. Box 5522, Chicago.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—H. H. Henline, 33 West Thirty-ninth street, New York 18.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
C. E. Davies, 29 West Thirty-ninth street.
New York 18.

RAILBOAD DIVISION — E. J. Woods.

New York 18.

RAILROAD DIVISION.—E. L. Woodward Railway Mechanical Engineer, 105 West Adams street, Chicago 3.

Anthractite Valley Car Foremen's Association.—O. R. Highfield, 74 Roosevelt Ter-

race, Wilkes-Barre, Pa. Meets January, March, May and November at Scramon, Pa. February, April, October and December at

Pace, Wilkes-Barre, Pa. Meets January, March, May and November at Scranson, Pa. February, April, October and December at Wilkes-Barre, Pa.

ASSOCIATION OF AMERICAN RAILROADS.—Charles H. Buford, vice-president Operations and Maintenance Department, Fransportation Building, Washington 6, D. C.

OFERATING SECTION.—J. C. Caviston, 30 Vesey street, New York 7.

MECHANICAL DIVISION.—A. C. Browning, 59 East Van Buren street, Chicago 5.

PURCHASES AND STORES DIVISION.—W. J. Farrell, Executive Vice Chairman, Transportation Building, Washington 6, D. C.

MOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington 6, D. C.

AMOTOR TRANSPORT DIVISION.—George M. Campbell, Transportation Building, Washington 6, D. C.

CANDIAN RAILWAY CLUB.—R. C. CTOOK, 441S Marcil avenue, N. D. G., Montreal, Que. Regular meetings, second Monday of each month, except June, July and August, a Windsor Hotel, Montreal, Que.

CAR DEPARTMENT ASSOCIATION OF ST. LOUIS.—J. J. Sheehan 1101 Missouri Pacific Bldg., St. Louis, Mo. Regular monthly meetings third Tuesday of each month, except June, July and August, Destended the Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs, 1a. Regular meetings, second Monday in each month, except June, July and August, La Saile Hotel, Chicago.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs, 1a. Regular meetings, second Thursday of each month.

CENTRAL RAILWAY CLUB OF BUFFALO.—R. E. Mann, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday of each month.

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CENTRAL RAILWAY CLUB OF BUFFALO.—R. E. Mann, Room 1840-2, Hotel Statler, Buffalo, N. Y. Regular meetings, second Friday of January February, March, April, May, October, and November at Engineering Societies Bldg., 29 West Thirtyninth

LOCOMOTIVE MAINTENANCE OFFICERS' ASSOCIATION.—C. M. Lipscomb, 1721 Parker St. North Little Rock, Ark.

Master Boller Makers' Association.—A. F. Stigmeier, secretary, 29 Parkwood street, Albany 3, N. Y.

New England Rallroad Club.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings, second Tuesday in each month, except June, July, August and September, at Hotel Vendome, Boston, Mass.

New York Railroad Club.—D. W. Pye, Room 527, 30 Church street, New York 7. Meetings, third Thursday in each month, except June, July, August, September and December, at 29 West Thirty-ninth street, New York 18. Northwest Car Mers's Association.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings first Monday each month, except June, July and August, at Midway Clubrooms, 1931 University avenue, St. Paul, Northwest Locomotive Association.—G. T. Cardell, 820 Northern Pacific Building, St. Paul, Minn. Meetings third Monday of each month, except June, July and August.

PACIFIC RAILWAY CLUB.—William S. Wollner, P. O. Box 458, San Rafael, Calif. Regular meetings, second Thursday of each alternate month at Palace Hotel, San Francisco, Calif., and Biltmore Hotel, Los Angeles.

RAILWAY CLUB or PITTSBURGH.—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY FUEL AND TRAVELING ENGINERS' Association.—T. Duff Smith, Room 811, Utilities Building, 327 South La Salle street, Chicago.

RAILWAY SUPPLY MANUFACTURERS' Association.—It. D. Conway, 308 Keenan Ruilding, Pittsburgh, Pittsburgh, Puttsburgh, Puttsburgh, Puttsburgh, Puttsburgh, Puttsburgh, Puttsburgh, Pa. Regular meetings, Sourch Thursday in month except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.

—J. D. Conway, 308 Keenan Building, Pitts-

—J. D. Conway, 308 Keenan Building, Pittsburgh, Pa.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—
A. T. Miller, Box 120 S, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel. Atlanta, Ga.

Toronto Railway Club.—D. M. George, Box 8.

Terminal A, Toronto, Ont. Meetings, fourth Monday of each month, except June, July, and August, at Royal York Hotel, Toronto. Western Railway Club.—E. E. Thulin, executive secretary, Suite 339 Hotel Sherman. Chicago. Regular meetings third Monday in each month, except June, July, August, September, December, and January, Hotel Sherman, Chicago.

Orders and Inquiries for New Equipment Placed Since the Closing of the September Issue

	LOCOMOTI	IVE ORDERS								
Road	No. of locos.	Type of loco.	Builder							
Chicago, Burlington & Quincy		4,000-hp. Diesel elec. pass.	Electro-Motive							
Road	No. of cars	Type of car	Builder							
Baltimore & Ohio	1,500 ¹ 500	70-ton covered hopper 50-ton hopper coal 50-ton hopper coal 70-ton covered hopper	American Car & Fdry							
Denver & Rio Grande Western Missouri-Kansas-Texas Texas & Pacific	200	70-ton ballast	American Car & Fdry							
FREIGHT-CAR INQUIRIES										
Reading	1,000	50-ton box								
Passenger-Car Orders										
Road Chicago, Burlington & Quincy	No. of cars 28 82 22 22 13 43 13 13 15	Type of car Comb. bagg. & buffet Chair Diners Parlor-lounge Baggmail Chair Grill Diner Sleeping Obslounge Baggmail	Edw. G. Budd Edw. G. Budd Pullman-Std. Pullman-Std. Pullman-Std. Pullman-Std. Pullman-Std. Pullman-Std. Pullman-Std. Pullman-Std.							

¹ Ten will be experimental, lightweight cars.

¹ For two complete new sets of equipment for the Chicago-Twin City Zephyrs. Each of the chair cars and the parlor-lounge cars will contain "Vista Domes"—raised glass-enclosed observation rooms—developed by General Motors Corporation, and introduced in an experimental Burlington car on July 23. The cars will be of stainless-steel construction.

¹ For a 12-car "Empire Builder," the Burlington's share of the five trains required to streamline the Chicago-Pacific Northwest service operated in connection with the Great Northern.

¹ To complete the streamlining of the Burlington's daytime Zephyr service between Chicago and Omaha, Neb., and Lincoln. The cars will be stainless steel.

Notes:
Plans have been virtually completed for new streamline passenger-train service between Chicago and Florida points, by the Pennsylvania, Chicago & Eastern Illinois, and Illinois Central and their southern connections. The proposed new trains will be powered by 4,000-hp. Diesel-electric locomotives and will consist of coaches, diner and all-room sleeping cars. It is expected that the trains will comprise 14 cars each and will cost about \$1,500,000 each, ownership will be shared by the Louisville & Nashville; Nashville, Chattanooga & St. Louis; Atlantic Coast Line; Florida East Coast; and Central of Georgia.

The Chicago, Burlington & Quincy, in association with the Denver & Rio Grande Western and the Western Pacific, is planning the purchase of 60 passenger cars of stainless-steel construction to re-equip the "Exposition Flyer" now operated daily by these lines between Chicago and San Francisco.

To do Today's Job

• Union Pacific's mighty 4-8-8-4's, designed to meet today's tremendous demands for fast freight movement, are capable of continuous operation under maximum horsepower output.

The firebox of each locomotive of this type is equipped with seven Security Circulators, making it possible to maintain a well proportioned brick arch.

The Water Line is Your Life Line



IT'S A GREAT NEW DAY FOR RAILROADING

It makes
little difference
to a
General Motors
Diesel
freight locomotive!



GANRAL MOTORS
LOCO MOTIVES

IT'S A GREAT NEW DAY FOR RAILROADING

Denver & Rio Grande

Western's 540

over mountainous terrain

rolled up

337,728 miles between

January 1942 and January 1945.

Average availability 83.7%.

Average miles per month 9,650.

St. Louis & Southwestern's 900

over flat country rolled up

66,998 miles between

June 1944 and January 1945.

Average availability 89.3%.

Average miles per month 11,166.

It makes little difference-

over mountains or on the level.

ON TO FINAL VICTORY * BUY MORE WAR BONDS

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS CORPORATION

-Supply Trade Notes -

WORTHINGTON PUMP & MACHINERY CORPORATION.—Ralph M. Watson, formerly chief engineer of the centrifugal engineering division of the Worthington Pump & Machinery Corporation, has been appointed assistant to Harry A. Feldbush, vice-president in charge of engineering.

WESTINGHOUSE ELECTRIC CORPORATION.—
Edgar W. Bartz has been appointed welding specialist for the San Francisco, Cal., bay area for the Westinghouse Electric Corporation. Prior to his recent transfer to San Francisco, Mr. Bartz had served in the company's Trafford, Pa., plant as a specialist in electric welding electrodes and materials.

The Westinghouse Electric Corporation has acquired the B. F. Sturtevant Company of Boston, Mass., manufacturer of air handling and processing equipment, which it will operate as a division of the parent company. In addition to its main plant at Boston, the Sturtevant Company has factories at Camden, N. J., La Salle, Ill., Berkeley, Calif., and Galt, Ontario, Canada.

Frank C. Kline, special representative for the lamp division of the Westinghouse Electric Corporation in its Northwestern district headquarters at Chicago, has been appointed acting manager of the Southwestern district with headquarters at St. Louis, Mo., to succeed Dan M. Galvin, who is entering private business in Dallas, Texas.

Monroe Auto Equipment Company.— The Monroe Auto Equipment Company, Monroe, Mich., has purchased a large new plant at Hillsdale, Mich., which will be equipped to compound and mould rubber and synthetics. The new plant is a part of a \$1,-500,000 expansion program recently announced by the company.

Donald L. Whitehouse, assistant manager of the Washington, D. C., office of the Monroe Auto Equipment Company, has been appointed manager of the newly established office in Chicago. The new office, which is located at 3001 Willoughby Tower building, Chicago, will handle sales of all of the company's products in the West.

Economy Arch Company.—Henry K. Patjens has been elected president of the Economy Arch Company of St. Louis, Mo. For the past seven years Mr. Patjens has been a sales engineer of the Baldwin Locomotive Works with headquarters in St. Louis.

AMERICAN STEEL & WIRE COMPANY.— Harry M. Francis has returned to the American Steel & Wire Co., U. S. Steel subsidiary, where he will resume his duties as assistant vice-president, sales, following a three-year period of service with the War Production Board in Washington. REPUBLIC STEEL CORPORATION—N. J. Clarke, vice-president in charge of sales, has been elected senior vice-president of the Republic Steel Corporation and J. M.



N. J. Clarke

Schlendorf, assistant vice-president of sales has been elected vice-president in charge of sales to succeed Mr. Clarke.

N. J. Clarke began his career as an office boy with the Bourne-Fuller Company in 1897. He was appointed salesman and later manager of the company's Pittsburgh, Pa., office and was transferred to Cleveland in 1912 as secretary and sales manager of the Upson Nut Company which Bourne-Fuller had acquired. He was a major in the ordnance department in the first world war. after which he returned to Bourne-Fuller as vice-president and general manager. He organized and became president of the Lake Erie Bolt & Nut Co. in 1919. Mr. Clarke was appointed vice-president in charge of sales for Republic in September, 1930, shortly after the corporation was formed.

J. M. Schlendorf was employed with the American Sheet & Tin Plate Co. from 1905



J. M. Schlendorf

to 1915. During the next two years he was assistant purchasing agent of the Willys-Overland Company and in 1917 was appointed vice-president in charge of sales of the Central Steel Company, Massillon, Ohio. He continued in that position when Central

Steel and the United Alloy Steel Corporation merged in 1926 to form the Central Alloy Steel Corporation. When that company became a part of the Republic Steel Corporation in 1930, Mr. Schlendorf was appointed manager of sales of the alloy steel division. He was appointed assistant vice-president in charge of sales in 1936.

Lamson & Sessions Company.—The Lamson & Sessions Company, Cleveland, Ohio, has acquired the Key Bolt Appliance Division of Hardinge Brothers, Inc., of Elmira, N. Y.

MALABAR MACHINE COMPANY. — Ralph IV. Payne of Washington, D. C., and E. A. Thonwell of Atlanta, Ga., have been appointed to the sales force of the Malabar Machine Company, product division of the Menasco Manufacturing Company.

UNITED STATES STEEL CORPORATION.— Charles H. Rhodes, vice-president of the United States Steel Corporation at Chicago, has retired.

FINCH TELECOMMUNICATIONS, INC.— Captain W. G. H. Finch, United States Naval Reserve, has been returned to inactive duty and will assume the presidency of Finch Telecommunications, Inc., Passaic and Clifton, N. J.

JOSEPH T. RYERSON & SON, INC.—Roland IV. Burt, eastern manager of railroad sales, has been appointed manager of the Tubular Products division of Joseph T. Ryerson & Son, Inc., with headquarters in Chicago.

PHILIP CAREY MANUFACTURING Co.— C. L. Owens, assistant general sales manager, has been appointed general sales manager of the Philip Carey Manufacturing Co., Cincinnati, Ohio.

AMERICAN ROLLING MILL COMPANY .-The functions of the Armco Railroad Sales Company, a wholly owned subsidiary of the American Rolling Mill Company, have been discontinued. The company's sheet and wheel business has been transferred to the American Rolling Mill Company and its drainage and fabricated products in the railroad field will be handled by the Armco Drainage & Metal Products, Inc., another wholly owned subsidiary. All of the Armco Railroad Company's key men and clerical force will become part of the American Rolling Mill organization. The following changes have been made: Logan T. Johnson, president and general manager, has been appointed administrative assistant to the sales manager of the American Rolling Mill Company; H. M. Arrick, district manager in St. Louis, Mo., has been appointed district manager of Armco in St. Louis; Robert Y. Barham, district manager in Chicago, has been appointed assistant district manager of Armco in Chicago; G. Russell Betts, salesman in the Chicago office, has been appointed manager

AIR COMPRESSOR



with Integral Lubricator and Governor

Integral mounting of the Lubricator and Governor simplifies installation and maintenance by eliminating the piping and fittings associated with independent mounting.

F-2 Lubricator has three feeds; two feeds for the air cylinders are cored through the mounting pads; the third feed supplies the entire steam end through a single tube.

Westinghouse Air Brake Company

Wilmerding, Pa.

October, 1945

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of railroad sales, O'Neall division, Armco Drainage & Metal Products, Inc., Chicago; Charles M. Colvin, sales engineer, Berkeley, Calif., has been appointed sales engineer, Armco Drainage & Metal Products, Berkeley; W. N. Crout, district manager in Cleveland, has been appointed assistant district manager for Armco in Cleveland; W. P. Lipscomb, district manager, Richmond, Va., has been appointed Armco's representative in Richmond; N. A. Powell, district manager, Houston, Tex., has been appointed manager of railroad sales, southwestern division, Armco Drainage & Metal Products, Houston; W. O. Robertson, district manager, Philadelphia, Pa., has been appointed manager of railroad sales, eastern division, Armco Drainage & Metal Products, Philadelphia; K. A. Smith, district manager, Berkeley, Calif., has been appointed district manager, Armco Drainage & Metal Products, Berkeley, and James L. Turvey, salesman, New York, has been appointed a salesman for Armco in New

EDWARD G. BUDD MANUFACTURING COM-PANY.—A two-year reconversion and expansion program costing \$16,000,000 is under way at the Edward G. Budd Manufacturing Company's plants in Philadelphia, Pa., and in Detroit, Mich., according to Edward G. Budd, president. Of this total, \$1,750,000 will be spent for reconverting and equipping Budd's Red Lion plant, recently leased for the manufacturing of from two to four stainless steel railroad passenger cars per day. This work is expected to be completed early next year. Construction of railroad cars has already been started without waiting for completion of this program and the first cars are expected to come off the lines this fall.

GENERAL ELECTRIC COMPANY.—Harry A. Winne, vice-president in charge of engineering for the General Electric Company's apparatus department, has been appointed vice-president in charge of engineering policy for the entire company, with head-quarters in Schenectady, N. Y. Ernest E. Johnson, assistant engineer of the aeronautics and marine engineering division, has been appointed to succeed Mr. Winne in the apparatus department. Victor S. Harrington has been appointed district manager of the newly created transportation division of the company's Pacific district apparatus department, with headquarters in San Francisco, Calif. For the past several years Mr. Harrington has been transportation specialist in the San Francsico office. Henry I. Guy, assistant manager of the transportation divisions at the Erie, Pa., works, has retired after more than 40 years of service with the company.

Harry A. Winne joined General Electric as a student engineer in the testing department after his graduation from Syracuse University with a degree in electrical engineering in 1910. The following year he was appointed head of the large motor, generator, and synchronous converter test, and subsequently assistant general night foreman of the testing department. In 1916 he was promoted to the power and mining engineering department, now known as the industrial divisions, and six years later was

assigned to the steel mill section of the industrial engineering department, becoming head of that section in 1930. He was appointed sales manager of the combined mining and steel mill section and, in April 1937, assistant to the engineering vice-president. He was elected vice-president in charge of apparatus design engineering in October, 1941, and of the engineering apparatus department in January, 1945.

Ernest E. Johnson joined the General Electric testing department after his graduation from Washington State College in 1922 with a degree in electrical engineering. He was assigned to the engineering general department in 1924; appointed assistant to the executive engineer of the General Electric research laboratory in 1931; engineer of the generator voltage regulator department in 1934, and assistant to the assistant to the Schenectady works manager in 1938. He subsequently became engineer of the aeronautics division, aeronautics and marine engineering department and for the past few years has been assistant engineer of the aeronautics and marine engineering division.

ELASTIC STOP NUT CORPORATION OF AMERICA.—O. M. Hullinger has been appointed manager of the Chicago office of the Elastic Stop Nut Corporation of America, with headquarters at 20 North Wacker Drive.

Mr. Hullinger came to the Esna corporation from the Line Material Company, where he was manager of transformer sales. Previous to that, he had served as sales manager for the Tips Tool Company. He was also with the Ohio Brass Company, and worked in railroad and public utility fields for many years. He received his engineering training at Armour Institute of Technology.

RANSOME MACHINERY COMPANY .- Hobart C. Ramsey, executive vice-president of the Worthington Pump & Machinery Corp., has been appointed also president of the Ransome Machinery Company, a Worthington subsidiary. J. G. Ten Eyck, who has just completed five years of active service with the U. S. Navy and who formerly was president of the industrial engineering firm of Ten Eyck, Inc., has been appointed vice-president and general manager of Ransome and Kenneth W. Horsman, formerly superintendent of welding and steel fabrication at Worthington's Harrison, N. J., works, has been transferred to Ransome as works manager.

ARCO COMPANY.—Plans have been announced for the immediate construction of a two-story research laboratory for the development of improved paints, lacquers, varnishes and new industrial coatings. The structure will be of steel and brick construction and will be located adjacent to the Arco Company's general offices at 7301 Bessemer Avenue, Cleveland.

NATIONAL BATTERY COMPANY.—The National Battery Company has announced plans for a new building on approximately eight acres of land in St. Paul, Minn., which it recently purchased from the Northern Pacific.

ADAMS & WESTLAKE Co.—Russell D. John has been appointed general sales manager of the Adams & Westlake Co. with headquarters in Elkhart, Ind. Mr. John joined the company as a salesman in the southeastern territory in 1926. He was appointed eastern manager in charge of the company's New York office in 1936. Fred C. Rauch succeeds Mr. John as eastern manager.

R. D. Wood COMPANY.—The R. D. Wood Company has moved its Philadelphia, Pa., offices to the Public Ledger Building, Independence Square.

PULLMAN-STANDARD CAR MANUFACTUR-ING COMPANY.—The Pullman-Standard Car Manufacturing Company, on September 1, announced that it has purchased from the Navy Department the huge ship assembly building erected at its car works plant in Chicago for the construction of ships. The sale places at the disposal of the company a building which will form the nucleus for a new passenger-car body shop. The structure, which has an area of 171,000 sq. ft., will be expanded to more than twice its present size and, in addition, will be provided with a covered section of another 40,000 sq. ft. for steel storage. When completed, the new shop will replace the present steel shop.

Obituary

FRED A. PAWSEY, chief engineer of the Ohio Locomotive Crane Company, Bucyrus, Ohio, died September 3. Mr. Pawsey was graduated from the Case School of Applied Science in 1905 and has been associated with the Ohio Locomotive Company since July, 1919.

CHARLES H. WILSON, manager of the Fairbanks, Morse & Company, railroad sales division, died in Chicago on September 13 following a brief illness.

R. G. PHILLABAUM, service engineer of the Locomotive Finished Material Company, in Chicago, was killed in an accident at his home on September 1.

F. Archer Thompson, head of the Detroit, Mich., office of the Bullard Company's machine-tool plant at Bridgeport, Conn., died July 31. He was 62 years of age.

Morris S. Earl, Chicago district manager of the Electric Service Manufacturing Company, died suddenly on September 3. Mr. Earl had been with the Electric Service Manufacturing Company since its formation in 1906. He was 62 years old.

EDWARD STEPTOE EVANS, founder and president of the Evans Products Company, Detroit, Mich., died on September 6. Mr. Evans was born at Thaxtons, Va., on May 24, 1879, and was educated at George Washington University. In 1915 he founded the Evans Products Company which has been active in the development of autoloading devices for freight cars and other

(Continued on next left-hand page)

The Atlantic Coast Line adopts "UNION" I.T.C.

In a move to expedite both freight and passenger traffic on its lines between Rocky Mount, N.C. and Wilmington, N.C., and between Wilmington, N.C. and Florence, S.C., the Atlantic Coast Line Railroad has begun the installation of "Union" Inductive Train Communication in this area.

Equipment of the frequency-modulation type for four wayside stations and 36 vehicles has been ordered, which will equip all regularly scheduled freight and passenger trains operating on specified lines of road.

"Union" I.T.C. will also be installed in the freight yards at South Rocky Mount and equipment for two yardmaster offices and nine switching locomotives has also been ordered.

The line to be equipped includes that portion of the doubletrack line from Rocky Mount to Contentnea, N.C.; the single-track line from Contentnea to Pee Dee, S.C., by way of Wilmington, and that portion of the double-track line from Pee Dee to Florence.

In addition to the immediate advantages derived from this system of train communication, the Atlantic Coast Line expects to gain experience in methods of utilizing these advantages in main-line operation.

"Union" Inductive Train Communication was selected for this service because it is to a unique degree a railroad man's system. Communication is not broadcast, but is directed along the tracks and adjacent line wires; and the system is as easy to use as the telephone.

Eighteen "Union" I.T.C. installations are now in service on 8 railroads. One yard and two road installations are under construction.

UNION SWITCH & SIGNAL CO.

I.T.C. Installation Main Line

SWISSVALE

NEW YORK CHICAGO

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ST. LOUIS SAN FRANCISCO



railroad equipment. During World War I, he served as a captain in the Quarter-master Corps, United States Army, and at the time of his death held a commission as Lieutenant Colonel, specialist reserve, U. S. Air Corps.

EDWARD J. SEARLES, manager of the Schaefer Equipment Company, Pittsburgh, Pa., died August 13. Mr. Searles was 69 years of age. He attended Johns Hopkins University. Following the completion of his engineering studies, he entered the apprentice training school of the Pennsylvania at Altoona, Pa., and subsequently progressed through many positions in the mechanical department of that railroad. Later he was employed by the Baltimore & Ohio and served in various capacities in the motive



Edward J. Searles

power department and ultimately as superintendent of motive power at Pittsburgh, Pa. He next was associated with the American Brake Shoe Company. He joined the Schaefer Equipment Company in 1914. Mr. Searles had been for many years treasurer of the Railway Club of Pittsburgh.

EDWARD L. GOODWIN, senior assistant mechanical superintendent of the Pullman Company, died on September 6, at his home in Chicago, after a long illness. Mr. Goodwin was 60 years of age and had served the Pullman Company for nearly 40 years.

CHARLES W. BURNS, who retired in October, 1937, as assistant to the mechanical superintendent of the Pullman Company, died at his home in Muskegon, Mich., on August 9.

Personal Mention

General

A. K. Galloway, general superintendent motive power and equipment of the Baltimore & Ohio at Baltimore, Md., has had his jurisdiction extended to cover the Baltimore & Ohio Chicago Terminal.

J. S. Breyer, master mechanic of the Southern at Meridian, Miss., has been appointed to the newly created position of general industrial agent, with headquarters at Meridian.

W. R. HEDEMANN, engineer of tests of the Baltimore & Ohio at Baltimore, Md., has had his jurisdiction extended to cover the Baltimore & Ohio Chicago Terminal.

W. G. McPherson, assistant superintendent of motive power, eastern lines, of the Canadian Pacific at Toronto, Ont., has retired.

O. R. Barefoot, division master mechanic of the Canadian Pacific at Toronto, Ont., has been appointed assistant superintendent of motive power, eastern lines, with headquarters at Toronto, Ont.

H. L. Ousley, air brake inspector of the Southern at Charlotte, N. C., has been appointed general Diesel supervisor at Spencer, N. C.

HARRY REES, superintendent motive power, Central Region, of the Baltimore & Ohio at Pittsburgh, Pa., has had his jurisdiction extended to include the Baltimore & Ohio Chicago Terminal.

J. T. MALLARD, master mechanic of the Norfolk Southern's Raleigh shops at Raleigh, N. C., has retired, and that position has been abolished.

W. B. WHITSITT, chief engineer motive power and equipment of the Baltimore & Ohio at Baltimore, Md., has had his jurisdiction extended to cover the Baltimore & Ohio Chicago Terminal.

J. H. Whipple, Jr., supervisor of Diesel equipment of the Denver & Rio Grande

Western at Burnham, Denver, Colo., has been appointed to the newly created position of superintendent of Diesel equipment for the system, with headquarters at Burnham.

FRED BUSCHER, foreman machine shop of the Northwestern Pacific at Tiburon, Calif., has been promoted to the position of foreman motive power and car departments, general shops, at Tiburon, Calif.

Master Mechanics and Road Foremen

K. A. Lentz, master mechanic of the Southern, at Somerset, Ky., has been transferred to Meridian, Miss.

JOHN FRANCIS LEIGHTIZER, master mechanic of the Prince Edward Island Division of the Canadian National, has retired after more than 40 years of service.

S. H. DuBose, master mechanic of the Southern at Ludlow, Ky., has been transferred to the position of master mechanic at Somerset, Ky.

D. J. EVERETT, general mechanical inspector of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed master mechanic of the Gulf, Colorado & Santa Fe, with headquarters at Galveston, Tex.

A. T. LOHMANN, master mechanic of the Northern division of the Gulf, Colorado & Santa Fe at Cleburne, Tex., has retired.

J. J. FRIEBOLT has been appointed road foreman of engines, Arkansas division, of the Missouri Pacific, with headquarters at Little Rock, Ark.

J. D. NIMMO, master mechanic of the Gulf Division of the Gulf, Colorado & Santa Fe, at Galveston, Tex., has been transferred to the Northern division, with headquarters at Cleburne, Tex.

HAROLD EDWARD Moore has been appointed master mechanic of the Prince Edward Island division of the Canadian National.

W. N. Foster, road foreman of engines on the East End of the Cumberland division of the Baltimore & Ohio, retired on June 1 after 45 years' service.

R. G. FIELD, assistant master mechanic of the Southern at Meridian, Miss., has been appointed master mechanic at Ludlow, Ky.

Car Department

EARL EAGLETON, coach foreman at the Decatur, Ill., shops of the Wabash, has been appointed car shop superintendent at Decatur.

A. L. GANTT has been appointed airbrake instructor of the Southern, with headquarters at Spencer, N. C.

Shop and Enginehouse

George W. Somers, foreman boilermaker of the Canadian National at Halifax, N. S. has been appointed boiler inspector, Atlantic region, with headquarters at Moncton, N. B.

W. S. Douglas, boiler foreman of the Canadian National at Fort Rouge, Man, has been appointed chief boiler inspector, western region.

L. E. Berry, general foreman of the Norfolk & Western at Portsmouth, Ohio, has been transferred to the position of general foreman at Crewe, Va.

W. M. TUCKER, a foreman of the Norfolk & Western at Iaeger, W. Va., has been promoted to the position of night engine-house foreman at Shenandoah, Va.

G. W. Hooper, assistant foreman of the machine shop of the Norfolk & Western at Roanoke, Va., has retired.

The A.S.F. Ride-Control Truck (A-3) is in the weight and price range of the conventional freight-car truck. It helps maintain an economical ratio between dead load and revenue load in freight-carrying equipment MINT. MARK BY O STRE CAST STEEL

A.S. B Ride-Control TRUCK

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LONG SPRING TRAVEL - CONSTANT FRICTION CONTROL

AMERICAN STEEL FOUNDRIES

CHICAGO

HARRISON H. Wosser, lead machinist of the Northwestern P acific at Tiburon, Calif., has been promoted to the position of foreman machine shop.

E. E. Barton, a machinist in the Roanoke, Va., shops of the Norfolk & Western, has been promoted to the position of assistant foreman of the machine shop.

H. B. ROBINSON, night enginehouse foreman of the Norfolk & Western at Shenandoah, Va., has been promoted to the position of general foreman at Portsmouth, Ohio.

R. L. Black, superintendent of the Roanoke, Va., shops of the Norfolk & Western, has retired.

W. E. Bowes, enginehouse foreman of the Pennsylvania, Pittsburgh division, with headquarters at Conemaugh, Pa., has been appointed enginehouse foreman—special duty, master mechanic's office, Pittsburgh division.

G. T. SAVAGE, enginehouse foreman at the Kinsman street enginehouse of the Pennsylvania at Cleveland, Ohio, has been appointed enginehouse foreman, Pittsburgh division, with headquarters at Conemaugh, Pa.

Bernard Cook, general foreman, locomotive department, of the Norfolk & Western at Roanoke, Va., has been appointed superintendent of the Roanoke shops.

W. S. GARRETT, general foreman of the Norfolk & Western at Crewe, Va., has been promoted to the position of general foreman, locomotive department, at Roanoke, Va.

F. E. Godwin, district boiler inspector of the Canadian National, Montreal, Que., district, has been appointed mechanical inspector of locomotives at Montreal.

J. E. Weiser, foreman of the Norfolk & Western at Winston-Salem, N. C., has been promoted to the position of foreman at Iaeger, W. Va.

E. H. Roy has been appointed general foreman of the Raleigh shops of the Norfolk Southern with headquarters at Raleigh, N. C.

W. H. Stevenson, for the last four years assistant superintendent of munitions at the Ogden shops of the Canadian Pacific in Calgary, Alta., has been appointed works manager of the shops.

W. J. Tostevin, assistant foreman at the Toronto, Ont., enginehouse of the Canadian National, has been appointed boiler inspector of the Montreal, Que., district.

Obituary

FRANK W. THOMAS, retired supervisor of apprentices of the Atchison, Topeka & Santa Fe, died in Topeka, Kan., on September 13.

ROBERT SALKELD, foreman motive power and car departments, general shops, of the Northwestern Pacific at Tiburon, Calif., died on August 14.

G. C. ELLER, assistant road foreman of engines of the Pennsylvania, Panhandle division, died on June 26.

G. A. Marx, car shop superintendent of the Wabash, at Decatur, Ill., died suddenly at Decatur, on August 16.

In Military Service

LEGION OF MERIT AWARD.—Charlie M. McManaway, a first lieutenant in Iran, has been awarded the Legion of Merit for "exceptionally meritorious conduct in the performance of outstanding service," according to word from Headquarters, Persian Gulf Command. Lieutenant McManaway, once a shop inspector for the Norfolk & Western, won his citation for performance as superintendent of the blacksmith shop, in Teheran's locomotive shops. There, it is noted, "he demonstrated a high degree of organizing ability, technical proficiency, and attention to duty in training unskilled military personnel to be efficient blacksmiths, and in systematizing the various operations of the blacksmith shop to the point where the shop developed into an effective, wellorganized unit." In addition, the citation continued, "Lt. McManaway, through outstanding skill and ingenuity developed special dies and jigs for the manufacture of other vitally-needed locomotive parts and at considerably lower cost."

M. R. S. ELECTRICAL TRANSMISSION COMPANY.—Electrical Transmission Company "D" of the 746th Railway Operating Battalion, the largest M. R. S. unit ever activated, recently has been on detached service with the 716th, and, according to the "Yankee Boomer" has "done some remarkable work in Germany." Assigned the job of operating the electrified line from Stuttgart to Augsburg, the 716th called in Captain Floyd D. Gibson, commanding officer of Company "D", four officers and 188 enlisted men who had trained on the Pennsylvania at Harrisburg, and on the New York Central at New York City. "D" company at once made surveys of the Stuttgart-Augsburg line, and repair work was begun on catenaries, sub-stations and transmission lines. German electrical maintenance men were also given jobs and were "In less than six carefully supervised. weeks," it is reported, electric locomotives were running on schedule from Munich to Stuttgart, with a Diesel shuttle system through Ulm. On this 130-mile stretch grades are reported "in excess of 2.5, but electric operation cut running time and hauled heavier loads," the report added.

763RD RAILWAY SHOP BATTALION.—The 763rd Railway Shop Battalion marked its second anniversary on July*28, at Louvain, Belgium, according to the Yankee Boomer. The battalion was organized in July, 1943, and since last December has repaired 109 2-8-0 locomotives, 20 0-6-0's and 13 Diesels, and processed 344 new locomotives of all types. At Louvain 6,508 locomotives have been dispatched, and at Antwerp, where Company "C" has been stationed, 7,470 cars have been repaired since February. The Antwerp unit has also aided the Belgians in the repair of 7,472 other cars.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

Washing Methods for Railroads.—Whiting Corporation, Harvey, Ill. Twelvepage, two-color bulletin, "Streamlined Washing Methods for Railroads," presents detailed drawings and photographs of the operation, construction and application of Whiting washers for motive power and rolling stock.

WATSON-STILLMAN PRODUCTS.—Watson-Stillman Company, Roselle, N. J. Bulletin No. 540-A. Describes and illustrates Walter stock-adjusting machine for lengthening, straightening, and shortening locomotive parts. Bulletin No. 550-A. Describes, with specifications and illustrations, hydraulic spring shop equipment—stripping machines. banding and forming presses, and testing machines—for railroad shops.

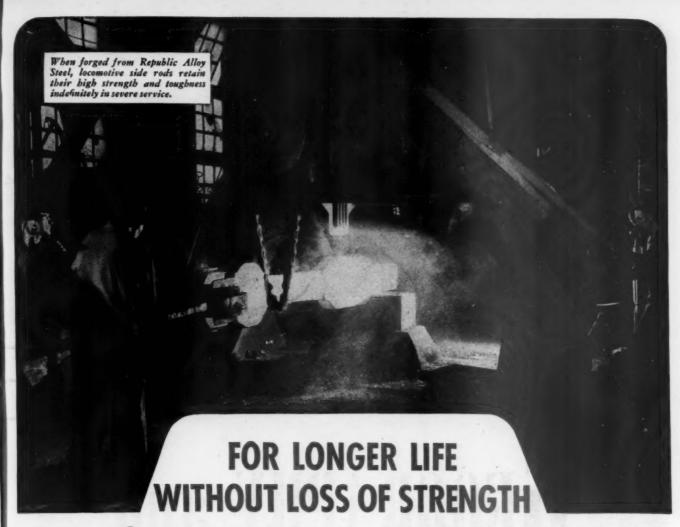
LIGHTING PRODUCTS.—Sylvania Electric Products Inc., 60 Boston street, Salem, Mass. Booklet containing comprehensive information about industrial, commercial, portable and inspection type fluorescent fixtures; fluorescent lamps, starters and lamp holders. Incandescent types listed include daylight lamps; large wattage lamps, vibration and rough service lamps; three-light lamps; floodlight and spotlight lamps; tubular lamps; lumline lamps; sign and decorative lamps; and those for 6, 12 and 30-volt service.

Forging Terms.—Kropp Forge Company, 5301 W. Roosevelt Road, Chicago 50. Twenty-page illustrated booklet, "Glossary of Forging Terms," defines the terms as used in forging practice, it being recognized that other definitions are sometimes employed in other industries for describing identical processes or operations, abbreviations, or symbols of names of metals and alloying elements.

Precision Lathes.—South Bend Lathe Works, 403 East Madison street, South Bend 22, Ind. Catalog 9-G describes and illustrates 9-in. South Bend precision lathes.

HIGH-STRENGTH STEEL.—American Rolling Mill Company, Middletown, Ohio. Twenty-four page booklet, "Armoo Low-Alloy High-Strength Steels" describes low-alloy steels with minimum yield strengths of 50,000 and 55,000 lb. per sq. in. Sections on drawing, forming and welding, also data on various designs.

"CUTTING GEAR TEETH ON A MILLING MACHINE."—The Cincinnati Milling Machine Company, Cincinnati 9, Ohio. Publication No. M-1397. Contains brief instructions on cutting worms and worm-wheels, and spur, helical and bevel gear teeth on a milling machine. The text is general and applies to any make of milling machine.



-no other material can equal ALLOY STEELS

One of the most important reasons why you should use alloy steels for vital parts of locomotives, cars and other equipment is the inherent ability of these steels to retain their original strength under the most severe conditions.

As examples, consider locomotive side rods, in which sudden reversal of stresses continually attempts to cause failure through fatigue... or engine bolts which must absorb varying concentrations of stress... or engine pins which must resist severe shocks and strains even when operating in sub-zero cold.

Alloy steels provide LASTING strength to as-

sure year-after-year safety in operating parts—to assure longer life and lower maintenance costs. And, in addition, they afford highest strength-to-weight ratios, uniform hardness, extreme toughness, and resistance to corrosion and high temperatures.

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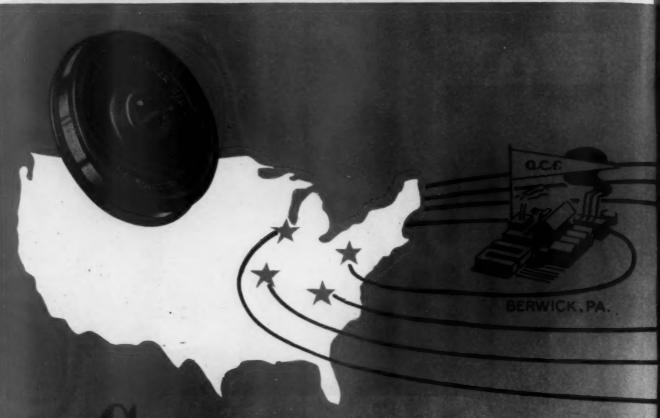
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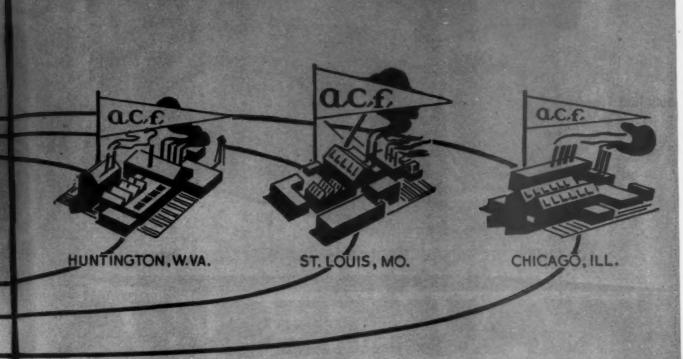
GEOGRAPHY and

O.C.f. is justly proud of the "AND FOUNDRY" part of its name — notably reflected in its volume production of chilled car wheels.

With chilled wheel plants at Berwick, Pa.; Huntington, W. Va.; Chicago, Ill. and St. Louis, Mo., more than 50% of U.S. rail mileage is less than 500 miles distant from an C.C.f. plant — assuring prompt delivery to railroads everywhere.

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WHATEVER Q.C.G. MAKES . . . IT IS KNOWN TO MAKE WELL!



Skill alike say.

Q.C.f. FOR CHILLED CAR WHEELS

O.C.f. chilled car wheels are made to the most exacting standards.

Technical controls include:

- Close control of chill by use of numerous test blocks throughout each heat.
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- Complete chemical analyses of test blocks and finished product from each heat.
- Years of skill backed up with final check by instrumental means, assures finest quality, long wearing tread metal.

In the Thirties, wheels accomplished an average of 47,900 gross ton miles per year; in 1944 service rose to 102,500 gross ton miles. By increasingly severe tests and controls, chilled car wheels took this added burden in stride. Small wonder, therefore, that of 16,500,000 wheels of all types in critical war time service — 80% are chilled car wheels!



To meet increased demands for electrical energy...

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ENGINE-GENERATOR

25 KW, DC-30 KVA, AC



Built in 3 Types: 64 volt, DC 110 volt, DC 220 volt, 3-phase AC

7-Ton Waukesha Railway Type Ice Engine



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• An important addition to the Waukesha line of enginedriven equipment—this new and larger Waukesha Engine-Generator—the result of Waukesha engineering know-how and 25,000,000 miles actual operation on railway cars and Pullmans over 25 major American railroad systems in the past ten years.

Built to meet the increased demand for electrical energy—this compact, lightweight, quiet, dependable power plant has a six-cylinder, propane gas or full Diesel engine. Cushion-mounted beneath the passenger car on the exclusive Waukesha supporting tracks, its "roll-out" feature facilitates inspection and servicing. Complete information without obligation.

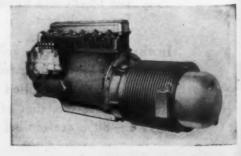
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WAUKESHA, WISCONSIN

Largest Builders of Mobile Engine-Driven Refrigeration and
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Waukesha 6-Cylinder Heavy-Duty Railway Type Power Plant



To help you keep the public's faith in Diesels

keep delays and maintenance to the minimum with . . .



DIESEL streamliners have captured the enthusiasm of the public—the youngster who watches the train flash through his home town and longs for the time when he can take his first ride—the business man who



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That's why it is so important to avoid breakdowns and delays. They are not only costly in dollars and cents but they tend to destroy the public's enthusiasm and confidence. That's why it is important to use the best Diesel lubricant you can get. It will pay-off in more and safer runs between overhauls, and in fewer road failures.

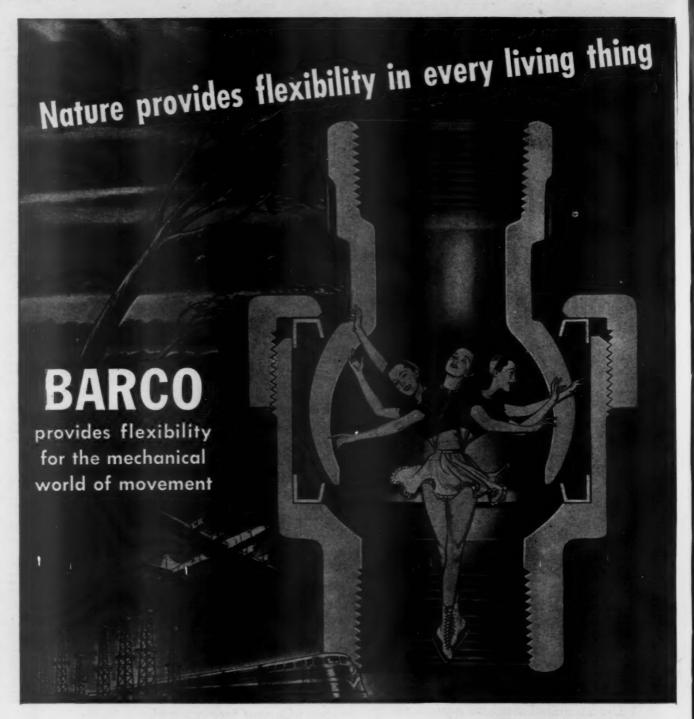
That's what you get with Nonpareil HD because it eliminates ring sticking, reduces wear and crankcase deposits. Test Nonpareil HD and compare maintenance time and costs with your present record.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

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Flexibility is vital in any fluid-conveying system. For over 30 years, engineers in every field of industry and transportation have found that Barco Flexible Joints provide reliable protection against breaks and leakage in fluid lines. By means of responsive movement, Barco compensates for contraction and expansion, absorbs the destructive action of vibration and shock. Barco's range of design provides for every flexible joint problem. Technical Engineering Information always available. Barco Manufacturing Co., Not Inc., Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal Canada.



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Not just a swivel joint...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

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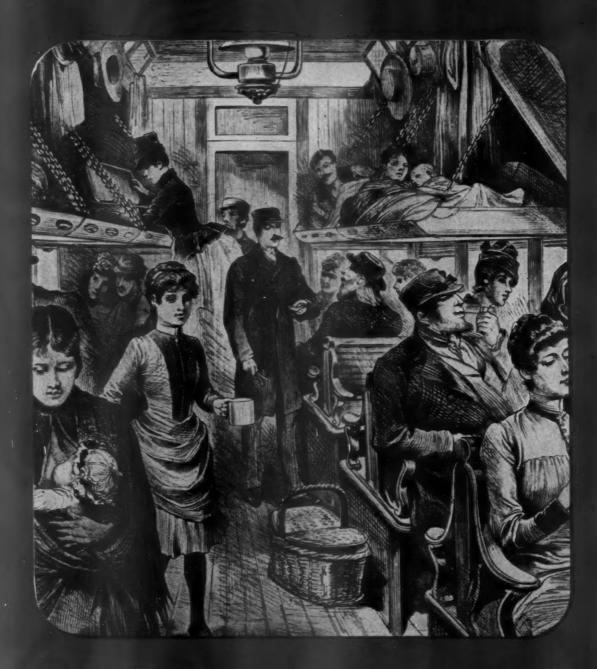


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POSTWAR PASSENGERS WILL PATRONIZE CARRIERS THAT OFFER THE MAXIMUM COMFORT, SERVICE, SPEED AND SAFETY.



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FOR OVER SIXTY YEARS
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UNINTERRUPTED Conveniences

expected by Passengers ... protected by

Modern Railroads depend on Westinghouse "De-ion" Nofuze Circuit Breakers

Tomorrow will see the most extensive passenger car modernization in railroad history. These modernization improvements represent large investments made for the sole purpose of gaining, and holding, patronage.

Temporary power failure in passenger cars, for any length of time, renders these conveniences useless . . . causes dissatisfaction, inconvenience, ill-will and possible loss of repeat revenue fare.

That is why modern railroads have protected their passenger car modernization investment by installing WESTINGHOUSE "De-ion" fuseless CIRCUIT BREAKERS. Designed to meet the most exacting requirements of railroad passenger car service, they have many advantages over conventional knife switches and fuses:

Westinghouse Special Features

There are five frames, sizes ranging in ratings from 10 to 600 amperes, which include features such as . . .

- Adjustable Magnetic Tripping provided on the F. & G. frame breakers.
- ... Thermal Action (E Frame).
- Thermal Magnetic Trip (F, G, K, L Frames).
- Quick-make and quick-break.
- "De-ion" Arc Quenchers.

Nothing to replace . . . up to 40% less space in some types . . . instant power flow restoration . . . tamperproof . . . trip-free on overloads . . . low watt loss . . . combinations for 32 or 64 volt d-c and 115 volt a-c.

CONSULT WESTINGHOUSE—as a further service to passenger car builders Westinghouse is prepared to assemble special breakers for special requirements. Ask your Westinghouse office for a copy of "Development of Electrical Equipment for Standard Railroad Passenger Cars" or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Railroad Electrical E



PACKAGED PROTECTION—Enclosed in a locked cabinet, accessible only to authorized personnel, "De-ion" Circuit Breakers are usually located at the end of the car.



Cylinder iron containing molybdenum has shown consistent ability to meet service requirements.

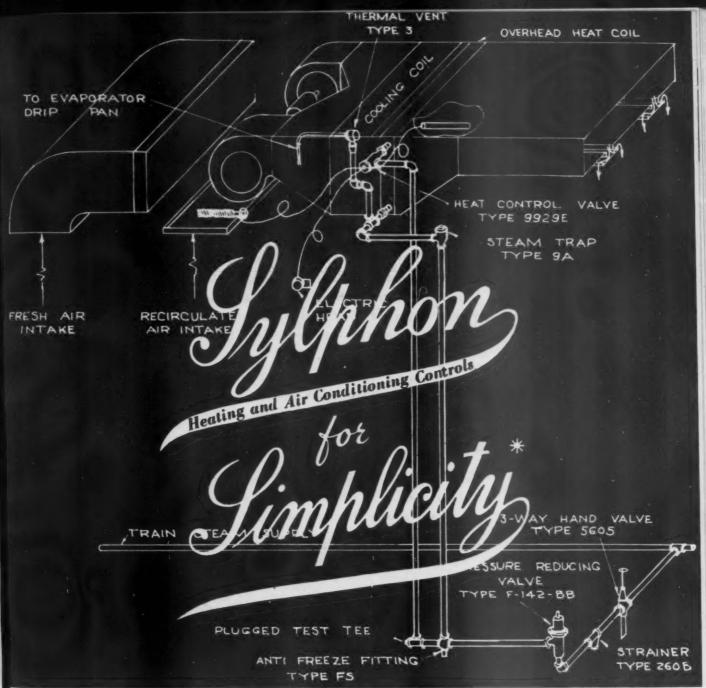


CLIMAX FURNISHES AUTHORITATIVE ENGINEERING

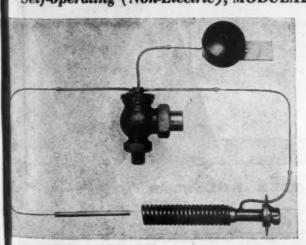


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* Self-operating (Non-Electric), MODULATING overhead heat control valve.



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Passengers are comfortable in Sylphon equipped cars because:

- (1) Supply of heat is continuous (instead of intermittent), to satisfy the requirements of the car.
- (2) No sudden changes in temperature of supply air. It changes gradually and automatically to keep car temperature uniform.
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- (4) Reheat resulting in comfortably low humidity available for cooling cycle.

THE FULTON SYLPHON COMPANY

TRANSPORTATION CONTROLS DIVISION DREXEL BUILDING • PHILADELPHIA 6, PA.

FEED MATERIE EATING 20 (30///)

THERE are certain fundamental laws which limit the maximum temperatures that can be obtained by both the open and closed types of Feedwater Heaters. These temperatures can be obtained, but not exceeded.

It is in the use of such equipment that its value is determined. The efficiency with which it operates—Its dependability—What it costs to maintain. These factors determine whether such equipment just pays, shows a large return, or is a definite loss.

That is why we have always stressed heat transfer efficiency, pump steam consumption and maintenance as the prime factors of feedwater heating.

To obtain high temperatures is one thing, to convert them into maximum net savings is another.

The Coffin Feed Water Heater System welcomes analysis on the basis of these factors.

THE J. S. COFFIN, JR., COMPANY ENGLEWOOD, NEW JERSEY

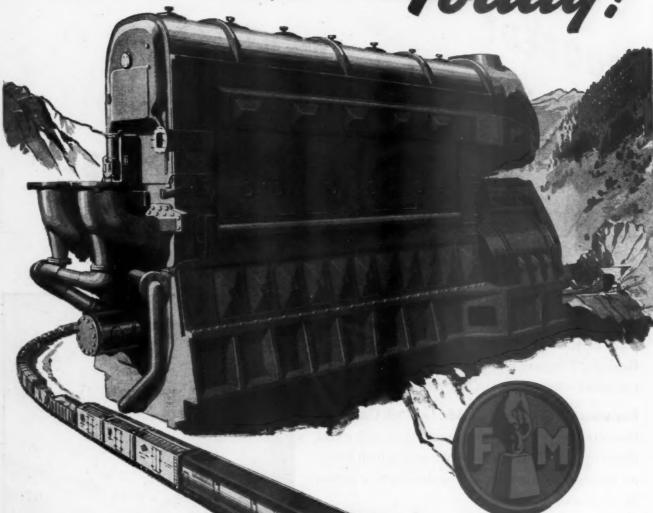
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POWER Today!



Opposed-Piston
Diesel Locomotive by

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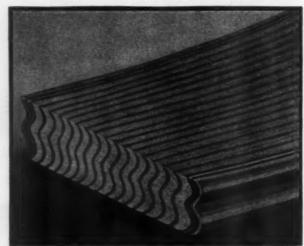
A name worth remembering



Safety against extreme temperatures and pressures. Metal and asbestos are the only materials used in the construction of Garlock Guardian Gaskets. They are unaffected by temperatures or pressures encountered in any gasket installation.

Resistance to gases and liquids. Garlock Guardian Gaskets are protected on their inner and outer edges by a double thickness of metal which forms an impregnable barrier to the destructive action of gases and liquids.

Tight joints under changing temperature conditions. Because of their unique structural design, Garlock Guardian Gaskets adjust themselves instantly and repeatedly to expansion and contraction due to temperature changes or vibration.





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GARLOCK

offer "a beautiful solution" to so many engineering problems

More than a dozen points of attachment are provided by this Alcoa Aluminum forging. Its use avoids high labor costs and manufacturing hazards, entailed in building up a part for the same task. A maximum saving in weight is achieved.

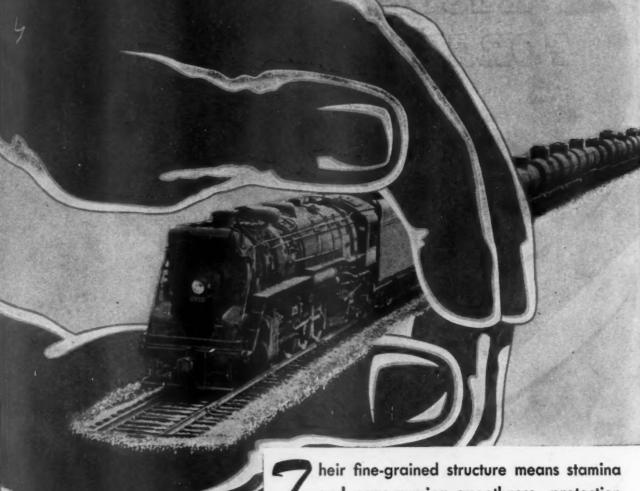
All of the usual advantages gained with Alcoa Aluminum are retained—strength, lightness, corrosion resistance and dependability.

Intricate parts, surprisingly large in size, are possible in Alcoa Aluminum forgings. Alcoa engineers, skilled in their design and production, will gladly assist in adapting aluminum forgings to your products. Aluminum Company of America, 1929 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM







heir fine-grained structure means stamina and easy-running smoothness—protection from scoring and excessive wear.

Keep your equipment rolling by standardizing on

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TUBES that are worth MILLIONS



At stake in every foot of B&W boiler tubing is the 64-year reputation for dependable performance earned by millions of dollars worth of B&W industrial, central station and marine boilers.

No one could be more directly concerned with a boiler's performance than the boiler maker—and a boiler is no better than its tubes. No one, therefore, has a stronger incentive than B&W to produce the best possible boiler tubes . . . because no other tube manufacturer is an integral

part of an organization that also builds boilers. Every time you buy B&W tubes for any steam generating or heat transfer equipment, you get the same high quality, safety, dimensional accuracy and easy workability insisted upon in B&W tubes for all new B&W-built boilers. Besides, you get tubes matched to your specific service conditions without prejudice toward any type or materials because B&W makes BOTH SEAMLESS and WELDED TUBES—all to one high standard—for every power plant requirement.

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Superior Automatic Soot Blowers blast away soot and cinder deposits from the flues and the combustion chamber of the locomotive. No interruption of service is necessary while they are functioning.

* INCREASE POWER

Successful U. S. and Foreign railroad experience is resulting in increased installations of Superior Automatic Soot Blowers in both domestic and foreign purchased locomotives manufactured by principal domestic builders.

Large savings effected by installation in older locomotives

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TABILIZED TRUCKS

have now been selected for all types and capacities of freight cars by 56 different railroads and private car lines.

The Truck You Should Specify!







Some of the advantages of the Dayton "D-R" V-Belt Axle Drive

The Heart of tomorrow's

railroad travel comfort

1. Quiet and smooth performance with high availability -in 15 years a mechanical failure due to V-Belts has never been reported.

2. Provides a flexible, cushioned connection between the car axle and the driven unit that protects generators and other equipment should a mechanical failure occur.

3. It is convenient and economical to install . . . no complicated or expensive truck changes are necessary . . . no special axles are necessary.

4. Duplicate equipment is not necessary to take care of emergencies-when wheel changes must be made, only the axle pulleys need to be removed.

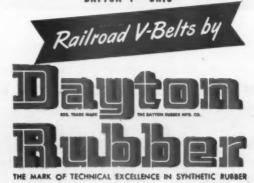
5. It greatly reduces maintenance cost on mechanical equipment as well as on the drives themselves.

6. It imposes a minimum weight on the car axle. 1. It is easy and simple to install, safe and dependable in operation, and insures uninterrupted performance.

Such luxury deserves the most dependable

It's a winning combination—beauty, deep-cushioned lounge chairs, soft music, and gaiety PLUS air conditioning that has the proper "feel", and "mood" lighting that doesn't let you down when the mood is just right. But there must be both! That's why creators of tomorrow's trains insist on the EXTRA dependability that Dayton "D-R" V-Belt Axle Drives provide. They know Daytons give the highest performance and safety factors of any under-car drive built. That's why more than twice as many cars are equipped with Dayton V-Belt Axle Drives for air conditioning than with any other drive. A Dayton railway specialist will gladly show you proof why most railroads prefer and specify Daytons. Write today.

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MAXIM Silencers make the

operation of powerful Diesels so quiet that engine exhaust is hardly heard above the rumble of the wheels. Where yards and right of way lie within city limits close to business and residential sections, quiet operation is a vitally necessary part of good public relations. Diesel trains slip in and out of stations quietly . . . freight is constantly moved in yards . . . with a new quietness that comes from properly silenced Diesel power. There's a further use of Maxim Silencers worth investigation in railroad operation . . .

because now Maxim makes Heat Recovery Silencers that not only provide effective silencing but also produce steam or hot water for heating

Heat Recovery Silencer Bulletin WH-101 contains information you should have. May we send you a copy?





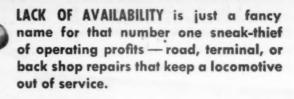
The silencers illustrated are Maxim Exhaust Manifold Silencers. They replace the conventional exhaust manifold and thus combine effective silencing with space saving. Standard Maxim Silencers are also widely used in locomotives and are often equipped with the Maxim Spark Arrestor for use in fire hazard areas such as refineries, ordnance plants, etc.

THE MAXIM SILENCER COMPANY . 64 HOMESTEAD AVE., HARTFORD, CONN.





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WHETHER YOU LIKE IT OR NOT—a freight locomotive of 65,000 lbs. tractive force, for instance, costs you 6½c for every minute it remains out of service in the shop, over and above the actual cost of repairs.*
That's almost \$100 a day!

HENNESSY MECHANICAL JOURNAL LUBRICATORS, by keeping locomotives in continuous service over long periods, are doing more to increase the overall availability of motive power, than any other recent steam locomotive development.

*Based on actual estimates of \$,0015 per lb. of tractive force per diem.

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U-S-S COR-TEN Celebrates



A FAMOUS "FIRST"—the beginning of a new era in freight car construction. This hopper car built by the Baltimore & Ohio Railroad Company is the first freight car built light with U·S·S COR-TEN. 12,186 lb. lighter than conventional heavy construction with A.A.R. structural car steel. Its load limit is 137,800 lb. and the lightweight is 31,200 lb., making the ratio of revenue load to gross load 81½%; the ratio of revenue load to lightweight, 4.42.

THEY CALLED THEM "TIN CANS" in 1935 but they're still on the job hauling 5 extra tons of ore and limestone every trip. "They'll fold up like an accordion the first time they go through the dumper" was a favorite comment of hard-boiled railroad men when 100 hopper cars like this weighing only 30,500 lb. were first put into service. Many expressed the opinion that they would not last more than a year. That was ten years ago. Since then these U·S·S COR-TEN cars,

That was ten years ago. Since then these U·S·S COR-TEN cars, the lightest hoppers ever built, have made an average of 274 trips. Not one of them has yet been given a general overhaul. Such service proves the stamina of U·S·S COR-TEN.



UNITED STATES STEEL

10 Years of Progress

1935-1945

TEN YEARS AGO LIGHTWEIGHT FREIGHT CAR CONSTRUCTION WAS PIONEERED BY U·S·S COR-TEN

HAILED as "the most important step forward in freight car modernization," the reduction of excess weight started with the advent of U·S·S CORTEN in 1935.

Since that time, lightweight construction with U·S·S COR-TEN has reduced weight in 53,042 freight cars an average of 2.65 tons per car. It has made available to the railroads a grand total of 140,561 bonus tons of carrying capacity—equivalent to 2810 extra 50-ton freight cars, enough to make up 53 complete trains... from which the revenue is all clear profit!

No other material can even approach U·S·S COR-TEN's record in reducing the weight of freight equipment—so economi-

cally, so safely and with such consistently good results.

This lightweight U·S·S COR-TEN equipment has stood the tough test of wartime operation. These cars are still in service. All of them have carried heavy loads, made high mileage, have effected operating economies that are impossible with conventional equipment.

As a first-hand measure of their performance, may we paraphrase a famous slogan, and suggest that you "ask the roads that own them."

EVERY SUNDAY EVENING, United States Steel presents

The Theatre Guild on the Air. American Broadcasting

Company coast-to-coast network. Consult your newspaper

for time and station.

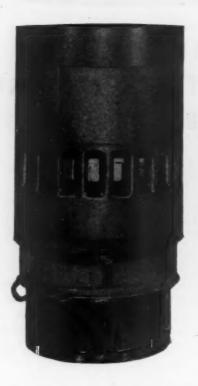
AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago and New York
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TODAY U.S.S COR-TEN — the premier low-alloy, high-strength steel—is again available to build your new equipment light, without loss of build your new equipment light, without loss of stamina, and at little if any increase in cost. Our engineers will gladly give you the benefit of their unequalled experience in applying it most economically to your designs.

INTAKE PORTS CLEAN after 157,076 miles of operation





No oil change in difficult Rock Island "Rocket" Test of RPM DELO Lubricating Oil

Special inhibiting, detergent and peptizing properties of RPM DELO Diesel Engine Lubricating Oil prevent port clogging deposits as shown by this tough trial in a "Rocket" Streamliner. RPM DELO Oil ran the entire 157,076 miles without a change, make-up "RPM" added as required. Oil consumption and cost were reduced. Liner wear was only one-third of normal, All rings were free and entire engine cleaner than with other oils.

RPM DELO Oil will give you greater engine availability, too. Get full information from your RPM DELO Oil Distributor, or write for details.



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RPM DELO Oil has world-wide distribution under the names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Imperial RPM DELO, CONCENTRATE





WE'LL FIT ELECTRICAL REPAIRS TO YOUR TIME LIMITATIONS

Since it is often possible to forecast rotating electrical equipment trouble before the emergency occurs, why not plan the necessary outage for repairs ahead of the breakdown? Thus production which depends on the machine can be arranged to fit into the repair plans and needed materials can be prepared before the machine is taken out of service. Outage time is saved; production disturbance is minimized.

We are especially equipped to help you with this planned maintenance. If the work is to be done in your plant, we will have experienced field crews there on the job the minute current is cut off. For repairs in our plant, facilities are readied before your equipment is received. In either case, materials are produced in advance.

We can handle emergencies, of course—promptly, efficiently, economically—but our field engineers are at your service to help you anticipate trouble and to correct it before it causes extra expense and loss of time. Write, wire or 'phone.

NATIONAL ELECTRIC COIL COMPANY

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ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—



OHIO, U. S. A.



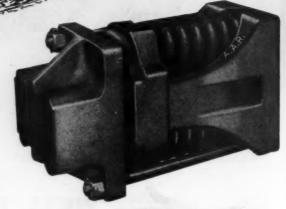
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FREIGHT OR Passenger They must be kept in service

In these times of emergency when cars and equipment, both freight and passenger, are being pushed to the utmost, it is imperative that every precaution be taken for their protection.

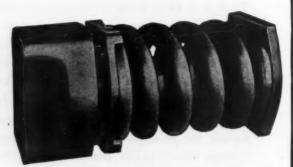
National Draft Gears by their smooth action, high shock absorption capacity, sturdiness and endurance, offer the maximum protection to cars and contents.



NATIONAL M-17-A DRAFT GEAR 223/8" long A.A.R. Approved



NATIONAL K-4 DRAFT GEAR
Designed especially to meet the requirements of high speed passenger service.



NATIONAL M-50-B DRAFT GEAR 201/8" long A.A.R. Approved

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General Offices: CLEVELAND, OHIO

Sales Offices: New York, Philadelphia, Chicago, St. Louis, San Francisco. Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, III.



uses the SPICER Positive Generator Drive

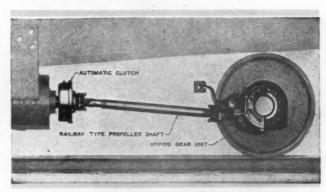
Night and day, year after year, Spicer Positive Generator Drives are delivering steady, dependable power for famous passenger trains on 27 different American railways. Over 2000 installations daily are proving the high efficiency of the Spicer Drive for generator power to lighting, air conditioning, refrigeration and other equipment.

The modernization of existing cars, and the development of new cars incorporating high standards of passenger comfort, will require increased and more dependable electrical power to operate satisfactorily with the expanded use of air conditioning, improved lighting, electromechanical water coolers, radio, electric kitchen equipment, etc., and other improvements to come. Cars will operate generally at higher speeds and will be much quieter and smoother. All of these are factors emphasizing the importance of using a reliable generator drive.

The simple means of applying the Spicer Drive

makes it readily adaptable to both old and new cars with few, if any, changes necessary in the car, truck or axle construction.

Other Spicer features include high efficiency and economy, safety, quietness and smoothness. Write for full details and literature describing all the profitable advantages Spicer Positive Generator Drives make available to you.



Exterior and cross-section view of Spicer Positive Generator Drive

SPICER Positive Generator Drive

Manufactured, Sold and Serviced by
Spicer Manufacturing Corporation, Toledo, Ohio



the moving finger were the story of Boister Spring Group Action 195

This is what Oscillation Curves prove about the movement of your spring groups in operation.

A.A.R. STANDARD SPRING GROUP

> HOLLAND SNUBBER SPRING AND 3 A.A.R. SPRINGS

Style A-6-A Holland Volute Snubber Springs

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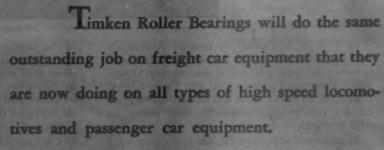
RAILWAY MECHANICAL ENGINEER

The Rock Island Lines Selects

TIMKEN RAILWAY JOURNAL BEARINGS

For Five new light weight Box Cars

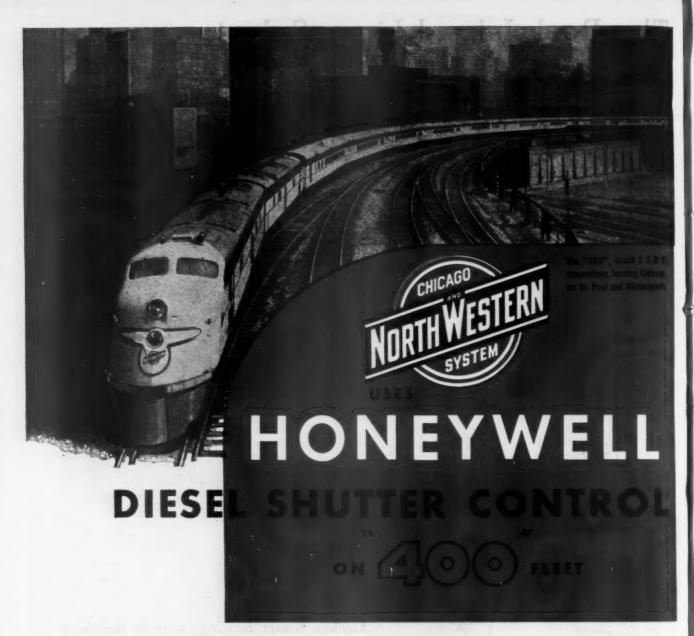




Timken Roller Bearing applications are now available for all types of high speed freight car trucks.

TIMKEN
THADEMARK HED. W. D. PAT. OFF.
RAILWAY ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

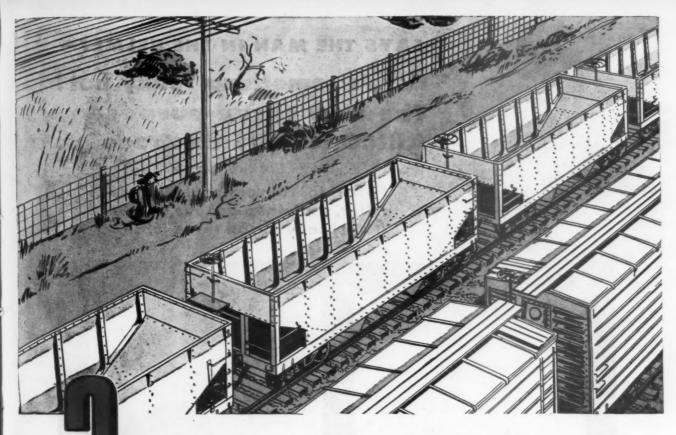


The C & N W "400" is one of America's first high speed daytime passenger trains, and is now celebrating its tenth anniversary. Operating between Chicago and the Twin Cities, it derives its name from the distance and time of its run—approximately 400 miles in 400 minutes.

Minneapolis-Honeywell has just completed installation of its shutter control system on nine diesel-electric locomotives of the Chicago & North Western Railway Co.'s "400" fleet. Because it maintains constant temperatures in the cooling system, this same shutter control system is successfully reducing operating costs and eliminating engine wear on diesel locomotives for many railroads, from coast to coast and from Canada to Mexico, under all types of operation and climates.

What the Honeywell shutter control system has accomplished for other railroads, it can do for you. Our representatives will be glad to consult with you at your convenience. Call or write Minneapolis-Honeywell Regulator Company, 433 East Erie Street, Chicago, Ill.





HIGH STRENGTH STEELS TO HELP YOU

SAVE WEIGHT WITH SAFETY

REPUBLIC ALDECOR

The latest development in high strength steels—the result of experience gained in ten years of high strength steel production and application—and possessing superior welding and forming characteristics.

REPUBLIC COR-TEN

Now celebrating the tenth anniversary of equipment made from it, COR-TEN has proved itself to be a dependable weight-reducing material for all types of railroad rolling stock.

REPUBLIC DOUBLE STRENGTH

A low-cost, high strength steel which for the past 10 years also has been widely used to cut dead-weight while maintaining strength and safety of railroad equipment.

There's no revenue in equipment deadweight — especially when that deadweight represents lost pay load which could be carried without increase in operating overhead.

That's why Republic offers you your choice of three different high strength steels to use in substituting greater pay load capacity for excess deadweight in building new freight and passenger equipment.

While all three of these steels possess similar physical and performance values, certain basic differences do exist which may make one, more than either of the others, better suited to meet certain application requirements. Taken as a group, Republic ALDE-COR, Republic COR-TEN and Re-

public DOUBLE STRENGTH provide a minimum yield strength of 50,000 pounds per square inch... are resistant to rust and corrosion... and are equal in abrasion resistance to carbon steels of like physical properties. All are produced in bars, plates, sheets and strip.

To assist you in determining which of these high strength steels is best adapted to your particular needs, Republic's experienced metallurgical staff is ready to work with you NOW. Write directly to:

REPUBLIC STEEL CORPORATION

GENERAL OFFICES • CLEVELAND 1, OHIO Export Department: Chrysler Building, New York 17, N.Y.



HIGH STRENGTH STEELS

Other Republic Products include Carbon, Alloy

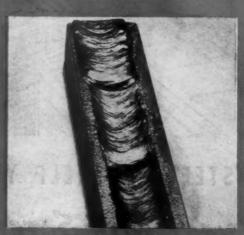


SAYS THE MAN IN THE HELMET-

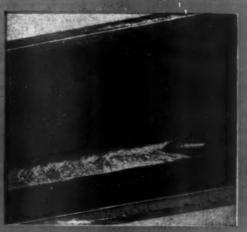
"Here's something really hot! The new three-purpose AIRCO No. 315 Electrode . . .

(AWS Classification E6020)

"I use it for conventional fillet, deep fillet, and deep groove welding. It's a honey for all three jobs.



"It takes planty of juice and has a high burn-off rate and faster deposition, which makes it ideal for deep-fillet welding. The arc is steady and forceful and has a fine spraying action, with very low spatter loss.



"Sieg covers well and sames off easily. Airco No. 315 can be used with AC and with DC, straight or reverse polarity. You can use it for any job that calls for a 6020 or 6030 electrode."



"Pusses are despity convex at the reet with good washup and no undercutting at the face. Penetration is medium with normal currents. It's excellent for all jobs where you need good appearance, high me chanical properties, and welds that will pass rigid X-Ray examination.

This new electrode is a notable addition to the famous line of Airco electrodes. Whatever your welding need, there's a qualityproved Airco electrode for

proved Airco electrode for every requirement. Catalog No. 120 describes the complete line. Write for a free copy to your local Airco office, or to Dept. RME Address Air Reduction, General Offices: 60 East 42d St., New York 17, N.Y. In Texas, Magnolia Airco Gas Products Company, General Offices; Houston 1, Texas.



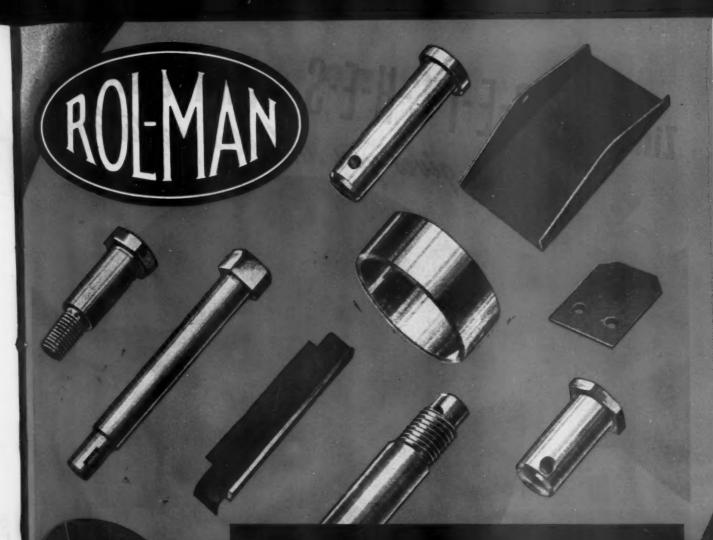


OFFICES IN ALL PRINCIPAL CITIES

Weld with



ELECTRODES FOR BETTER WELDS AND EASIER WELDING





Labor and time-out-of-service cost for replacing pins, bushings and wear plates, so dwarfs the actual cost of these parts that the best is never too good. Replace with Rol-man and they are "in place" for many years.

If you specify Rol-man for new cars or locomotives, you're going the limit to keep them out of the shop, for a long, long time.

Manganese Steel Forge Co., 2813 Castor Ave., Philadelphia 34, Pa.

Rol-man has been serving leading railroads for over 20 years.

PINS BUSHINGS WEAR PLATES

Rol-Man Pins and Bushings are ground to precision diameters. Wear Plates are fabricated to your specifications, ready for installation.

NEER

Zinc S-T-R-E-T-C-H-E-S with the steel... ... gives you unbroken protection ... gives you unbroken protection

In this severe test ARMCO.
ZINCGRIP is folded and refolded. Regular galvanized steel would flake badly at the corner to which the pencil points, but the coating on ZINCGRIP remains unbroken.

STEEL

This is the famous "Handkerchief Test" on Armco Zincgrip.

It clearly shows how the special zinc coating *stretches* with the steel during severe fabricating operations. This means *unbroken zinc protection* for your passenger and freight car roofs and other parts.

Regular galvanized steel, as satisfactory as it is for many uses, won't take the severe draws or double-lock seaming required for many parts. The zinc coating flakes off, and complete protection is lost. Naturally the equipment doesn't stand up as long in service, costs money to replace.



ARMCO ZINCGRIP solves the problem. Its specially-applied zinc coating clings tightly to drawn corners as well as the flat parts. No bare spots are left for corrosion to feed on.

If your sheet steel car parts need zinc protection, we'd like to tell you more about Armco Zincgrip.* Just write The American Rolling Mill Company, 1671 Curtis Street, Middletown, Ohio, for our free booklet.

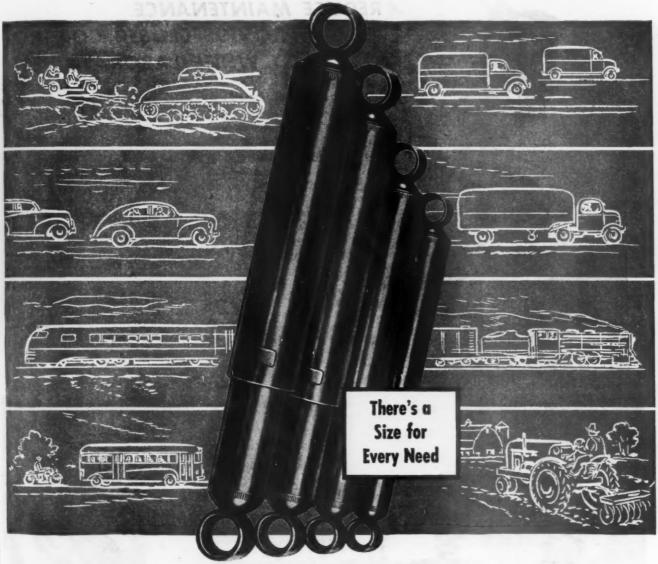
THE AMERICAN ROLLING MILL COMPANY

*ARMCO PAINTGRIP, a special Bonderized surface treatment, is recommended for ZINCGRIP products requiring mmediate painting.

Smoothing and Improving the Ride

IN PEACE & WAR . ON HIGHWAY & RAILWAY . ON BATTLEFIELD & FARM

MONROE DIRECT-DOUBLE-ACTION HYDRAULIC SHOCK ABSORBERS



In every line of endeavor there is always one "best," one product that sets the standard of quality, one organization recognized as the source of innovations, of most advanced design, of finest construction. In the field of Hydraulic Shock Absorbers for smoothing and improving the ride in motor vehicles and railway cars, that leader is Monroe. Monroe Direct-Double-Action Hydraulic Shock Absorbers have been standard on leading American cars, trucks and railway passenger cars. In the war they proved their superi-

ority on motorized vehicles from Jeeps to great tanks. Today, the experiences gained in this hard, critical service is reflected in even finer Monroe Products.



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*REDUCE MAINTENANCE * PROVIDE CLOSER CONTROL AT WHITE LABORATORIES!

WHITE LABORATORIES can tolerate no deviation from set.process steam pressures, in spite of widely fluctuating loads, in the manufacture of its vitamin products and other pharmaceuticals. At the same time, maintenance must be kept within reasonable limits.

TO REDUCE FREQUENT AND COSTLY REGULATOR MAINTENANCE. Norman E. Smith, Chief Engineer, began installing Leslie products back in 1932. Now there are 60 Leslie Pressure Reducing Valves in the Boiler House, Manufacturing Plant, Compressed Air and Air Conditioning Systems—as well as Leslie Pump Governors and Leslie Temperature Regulators. Yet only one Leslie product has needed a major repair in these twelve years.

THE PRINCIPLE OF THE SPRING-LOADED INTERNAL PILOT, PISTON-OPERATED VALVE, developed by Leslie, is responsible for this combination of ruggedness with unusual sensitivity and accuracy. The bronze body valves are of 88-10-2 composition, enabling them to withstand pressures to 300 p.s.i. and temperatures to 550 degrees F. Cast steel valves are designed for 600 p.s.i. and temperatures to 750 degrees F. The main valve seats are Stellited to 600 Brinell and the main valves are surface hardened to 800 Brinell.



governors such as this Leslie, standard equipment for White Laboratories fuel oil and feed water pumps.

(Center, above) LESLIE TEMPERATURE REGULATORS employed in White Laboratories include the self-contained unit at the left and the auxiliary eperated unit at the right.

(Right, above) LESLIE PRESSURE REDUCING VALVES get many unusual jobs at White Laboratories. Here, in the oil feed line, a J-1 model safeguards the air conditioning air compressor from shut-downs.

LESLIE CO. - LYNDHURST - NEW JERSEY



Your P-M Service Engineer works for you... that's his job! For years Paxton-Mitchell Company has maintained a staff of thoroughly trained Service Engineers well-versed in motive power operation. Experience and contact with packing problems under all kinds of operating conditions makes these engineers a ready source for first hand knowledge of packing difficulties and what to do about them. While P-M Service Engineers claim no superior knowledge, they enjoy the benefits of broad experience of which they give freely,

endeavoring, at all times to render a competent service to those on whom they call. Let your P-M Service Engineer help you with your piston rod and valve stem packing problems. He's at your service!

PAXTON-MITCHELL COMPANY

2614 Martha Street Omaha 5, Nebraska P-M Metallic Rod Packing * P-M Iron and Bronze Castings

EXPORT DEPARTMENT FOR METALLIC ROD PACKING International Railway Supply Company 30 Church Street - New York 7, N. Y.

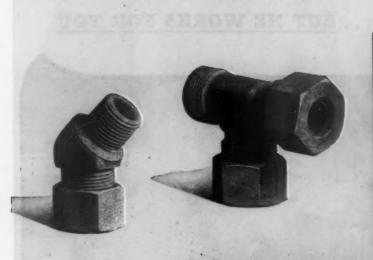
The Packing that Packs



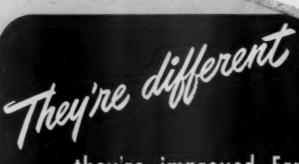
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CE, ucts ves Air and has

for cuing 550 er-600 efl.







they're improved Ermeto fittings!

Weatherhead Ermeto fittings are made in all sizes and types. They can be furnished in O.D. tube or in nominal pipe sizes from 1/8 inch to 2 inch O.D. Ermeto fittings for special installations are also available for a wide variety of uses. These fittings have been field tested and approved in thousands of installations on hydraulic, oil, water, gas and

fuel lines. They will withstand excessive vibration for an indefinite period and hold beyond the burst strength of the tube itself. For information or literature, write or phone any Weatherhead branch office.



Write today for this new Ermeto catalog. It's free! Look Ahead with



TROUBLE-FREE PINS and BUSHINGS?

-better talk with API"

SMALL BUT MIGHTY. That's the story of the precise railroad bushing shown above. For maintenance replacement, it promises long and trouble-free service. For original equipment on tomorrow's New Era of rail transport, it promises equal durability . . . because it's a product of skill and experience! Hardened and ground parts are our specialty. We're geared to run them faster and better . . . for the low first cost and long life every railroad man looks for. If you have a pin and bushing problem, we'll see that it gets prompt attention. Phone, wire or write us.

AERONAUTICAL PRODUCTS, Inc.

Detroit Plant and Administrative Offices: Detroit 12, Michigan. Ohio Plant: Washington Court House, Ohio



Houdaille* hydraulic instruments for vertical and lateral control safe-guard the riding comfort and stability of America's foremost trains.

New and still better Houdailles, the result of millions of miles of experience, now are being built for trains which soon will make their post-war bow.

HOUDE ENGINEERING DIVISION OF

HOUDAILLE-HERSHEY CORPORATION

MAKERS OF HYDRAULIC CONTROLS BUFFALO 11, NEW YORK

*Pronounced-Hoo-dye



Change for the sake of change doesn't appeal to railroaders. But change that improves quality and performance is always welcomed. Reliance research laboratories are on the job with one idea always in mind, to improve Reliance Locomotive Hy-Crome Spring Washers to the end where they will keep bolts and nuts TIGHTER—LONGER. Field tests help confirm laboratory test conclusions. A performance test on your motive power with Locomotive Hy-Crome Spring Washers will be convincing.

RELIANCE LOCOMOTIVE HY-CROME SPRING WASHERS

mark the milestones in railroad spring washer improvement. Step by step, Reliance has given railroaders these spring washer betterments: ALLOY STEEL... ROUNDED OUTER EDGE... GROUND DEFLECTION... RADIUSED INSIDE EDGE... CONTROLLED TENSION... NON-FATIGUING set under compression... UNIFORMITY as to design, dimension and heat treatment.. MAXIMUM tension from a helical-type Spring Washer with MINIMUM bolt length.

To specify Reliance Locomotive Hy-Crome Spring Washers for New Locomotives or Rolling stock is smart engineering. They are the result of years of Spring Washer specialization.

> "Tension There In Spite Of Wear"

EATON MANUFACTURING COMPANY

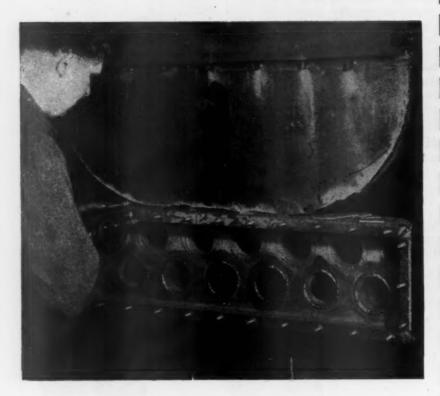
Walle for informative MOTIVE POWER FOLDER today.

MASSILLON, OHIO

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Sales Offices: New York . Cleveland . Detroit . Chicago . St. Louis . San Francisco . Montrea

Nelson <u>Automatic</u> Stud Welding saves time and material!



Nelson Stud Welding saves time and material because it eliminates drilling holes and tapping to secure studs. In less than a second studs from 3/4" diameter are secured. Automatic operation and accurate arc timing control produce complete fusion of the stud to metal. Operators are trained quickly and produce consistent results.

Thousands of stud welders are now used by more than 750 industrial plants and shipyards . . . because 500 to 1000 studs per operator can be secured per shift.

For rapid *precision* production of stud welded parts single and multiple stud welding units are available which weld one or more studs of various sizes at the rate of 20 to 30 welds per minute.

Write today for complete information on this time and material-saving equipment:



NELSON SPECIALTY
WELDING EQUIPMENT CORP.

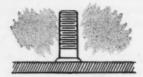
Dept. R, 440 Peralta Avenue San Leandro, California

Eastern Representative: Camden Stud Welding Corp., 1416 South Sixth Street, Camden, N. J.

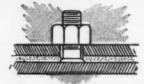
HOW NELSON STUDS
ELIMINATE DRILLING
AND TAPPING



After layout and centerpunching a stud is placed in the gun chuck. The pointed end is located in the punch mark and the trigger pulled. Instantly the arc flashes and the weld is made. The operator loads again and proceeds to the next weld.



Complete fusion between stud and metal results . . . drilling and tapping operations have been eliminated.



Cover and gasket fit easily and a neater result is obtained. One gun welds any diameter stud — a standard welding machine is used.



Cutaway of typical stud weld. Etched with Nital to show penetration.



Which will you have?



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CAR WITH UNTREATED DECKING IN FOR PEPAIRS
AFTER 5 YEARS



CAR WITH PRESSURE-TREATED SIDING AND DECKING
IN FOR REPAIRS AFTER 14 YEARS

A lot of railroad men today are asking themselves whether they can afford to continue the use of untreated decks. The pictures shown above tell why.

The car at left, with untreated decking, is in bad condition after only 5 years' service. The car at right, with pressure-treated deck-

ing, is in better condition after 14 years' service. The treated siding has been damaged, but there is remarkably little breakage and no decay.

Based on typical costs as reported by a user, the yearly charge for the treated deck was less than half that of the untreated deck. Or, to figure it another way, the treated deck paid for itself in less than two years of additional service... and for the next seven years the installation returned a "profit" of over \$20.00 annually.

We advocate the treatment of car lumber, and will be glad to quote on your requirements.

KOPPERS COMPANY, INC. • WOOD PRESERVING DIVISION PITTSBURGH 19, PA.

KOPPERS

Buy War Bonds
— and Keep Them!





DAMAGE EXPELLER!

While using slotted screws, work-spoiling driver skids were causing frequent damage to plastic shades in the assembly of desk lamps. Refinishing slowed down production, and spoilage boosted costs...until the manufacturer started using Phillips Recessed Head Screws.



OUTPUT IMPELLER!

With the change to Phillips Screws, damage and delays were eliminated. And with no more worry about driver skids, power drivers could be used, speeding output further. Costs came tumbling down...production set new records.



PROBLEM DISPELLER!

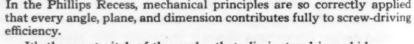
Phillips Recessed Head Screws, engineered to take heavier driving pressures, simplify product design, give it more strength, more rigidity...often with the use of fewer screws. Screw-driving is faster, easier, surer...permits design innovations slotted screws just can't touch.



SALES PROPELLER!

The Phillips Recessed Head radiates quality. It's trimmer ... smarter looking... modern as tomorrow. No unsightly burns and uneven appearance to cool off interested prospects. Put the extra sales push of Phillips Screws behind your product... make good merchandise look better!





... It's the exact pitch of the angles that eliminates driver skids.

... It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

... It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% - cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS Recessed SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

• • • • • • • Made In all sizes, types and head styles • • • • • • •

25 URCES

American Serew Co., Providence, R. I.
A lantic Serew Works, Hartford, Conn.
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Chandler Products Corp., Cleveland, Ohle
Continental Serew Ce., New Bedford, Mass.
The Corbin Serew Cenp., New Britain, Conn.
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The H. M. Harper Co., Chicago, III.
International Screw Co., Detroit, Mich.
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WE HAVE—your new air conditioning equipment will be more efficient and smaller!

FOR EXAMPLE — a 7-ton-capacity Compressor-Condenser unit measures only 25"x84"x40"—a Fan-Evaporator unit of equivalent rating needs only 20"x 44"x 52"...sizes which conform well with new design considerations.

And, these new units match the increased efficiency being planned into cars of tomorrow. Depending upon passenger capacity, motors of from $\frac{1}{2}$ to 1 h.p., are sufficient to operate the fan blowers, even if a maximum of 2700 c.f.m. at $\frac{1}{8}$ " s.p. is required! Compressor efficiency, too, has been upped—to reduce horse power costs per ton of refrigeration.

You get all this, plus the flexibility and measurable advantages of a multi-cylinder compressor that permits variable output under con-

tinuous operation. The superior comfort of a system that maintains a uniform temperature and humidity—instead of sharp fluctuations between wide limits—is apparent.

OTHER UNITS FOR "CUSTOM" JOBS

... with the same advantages of efficiency and small size. There's the Divided Evaporator, the Dry Surface Condenser, the Motor Compressor unit, and the Evaporative Condenser for a water spray. All are designed to blend with your plans, whether they call for complete air conditioning installations... or replacement and additions to mechanical or ice-activated systems in existing rolling stock. Your problems are also those of the Sturtevant engineers. Their assistance is yours for the asking.

B. F. STURTEVANT COMPANY

HYDE PARK BOSTON 36, MASS.

Branch Offices in Principal Cities

STURTEVANT GIVES YOU ALL 4 RAILROADING ADVANTAGES

- More uniform temperature and humidity conditions in the car.
- 2 Equipment designed for easy maintenance.
- 3 Equipment designed for minimum space and weight.
- Equipment that requires a minimum power load.



STURTEVANT "Railvane" Units or Systems are used by 40 railroads and are covered by more than 80 issued patents and patents pending

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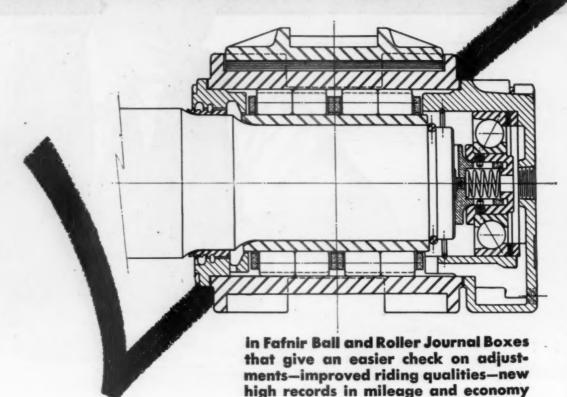
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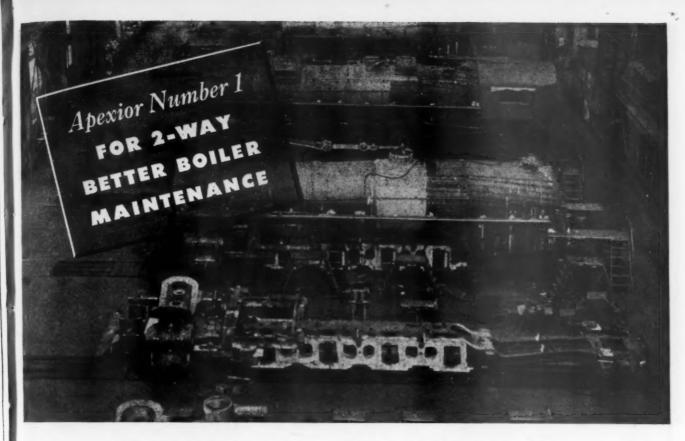
Note These New Features



- Keeping in mind the 2,000,000 mile service records and the low cost maintenance figures already set up by Fafnir Ball and Roller Journal Bearings—check up on the service you can expect from these additional features incorporated in the new model Fafnirs!
- Spring loaded thrust assembly is in constant contact with the end of the axle thereby eliminating thrust bushing wear and putting pure thrust load on anti-friction bearing.
- No increase in lateral clearance due to bushing wear with decrease in operating temperatures.
- Conveniently located pipe plug can be removed to simplify checking of lateral clearance, eliminating the necessity of removing entire cover.
- Same lateral clearance as maintained in other types of Fafnir Journal Boxes to assure easier riding qualities and to reduce shock impact.
- Fafnirs are famous for easy starts and fast hauls—positive lubrication at all speeds—effective sealing out of dirt and water—cutting maintenance costs to the bone—adaptable to Standard AAR pedestal openings as well as most other types of wide pedestal openings—inner rings need not be removed at wheel turning periods, to apply bearings, simply slide on journal. Write for details. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL & ROLLER JOURNAL BEARINGS

REDUCE STARTING LOADS UP TO 90% . . . CUT MAINTENANCE COSTS TWO-THIRDS



Cleaner Operation . . . Shorter Shopping Time

You gain two ways when your locomotive boiler shells are surfaced with APEXIOR NUMBER 1.

Dirt and scale find no crevices to cling to when metal surfaces are APEXIORIZED. The smooth surface and lack of contact with the metal itself prevent chemical bonding, strong adhesion.

The tough, durable film of APEXIOR NUMBER 1, a few thousandths of an inch thick, does not retard heat transfer. On the contrary, by retarding the deposit of heat-insulating layers of scale and dirt, it prolongs the period of high heat-transfer efficiency.

The absence of chemical bonding, permitting only loose adhesion of solids to APEXIOR NUMBER 1, results in easier cleaning.

SIMPLIFIES FEEDWATER SERVICE

APEXIOR NUMBER 1 assists the work of the water service department by increasing the durability and raising the sur-

face quality of boiler metal. It is not a substitute for feedwater preparation and is inert to the chemicals used. It protects the metal under boiler water and steam temperatures and pressures. APEXIOR NUMBER 1 is regularly used on thousands of locomotives subject to I.C.C. Inspection.

APEXIOR NUMBER 3 FOR "COLD-WET" SURFACES

The water-side of locomotive tender cisterns is protected against cold water contact by this brush-applied shiny, jet-black technical protective coating. For water protection under 125°F. APEXIOR NUMBER 3 is inert and non-toxic.

APEXIOR ALWAYS AVAILABLE

Expanded production makes APEXIOR surfacing materials available for shipment every day to railroads, industrial power plants, utilities and marine users throughout the country. See information in *Locomotive Cyclopaedia*.

Write for bulletin today.

APEXIOR Keep	hs new metal newGive	es old metal new life DAMPNEY
		THE DAMPNEY COMPANY OF AMERICA Hyde Park, Boston 36, Mass. Please send free Bulletin.
		Name
New Metal Kept New For Years	Old Metal Given New Life	Address



Inside an engine, Pedrick rings make things go like clockwork

More power, more pep, more hours on the job . . . that's the report we've been hearing from users of Pedrick rings for twenty-five years. Once Pedrick rings are in, it's a long, long time before you need to recondition again.

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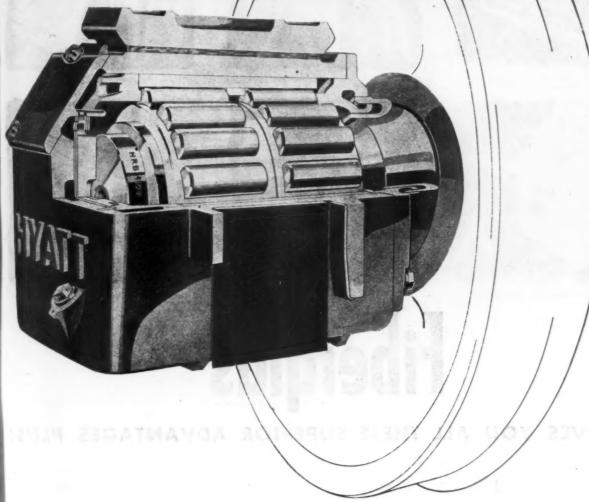
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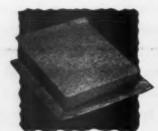
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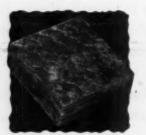
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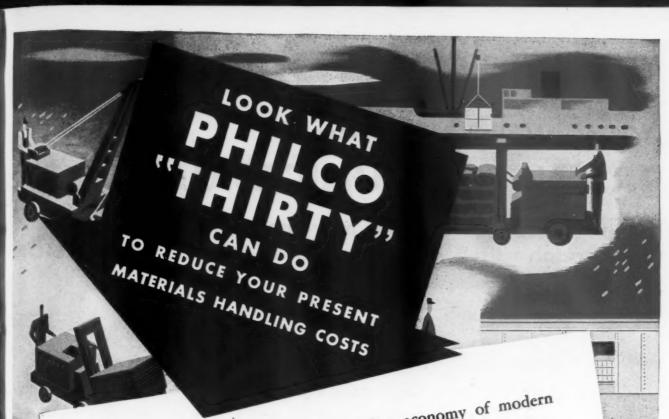
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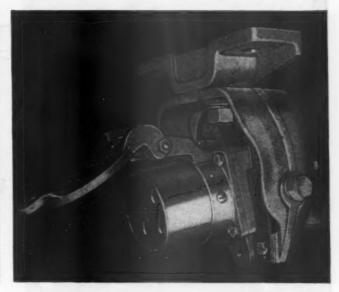
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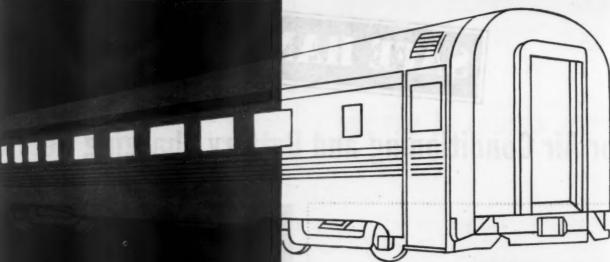
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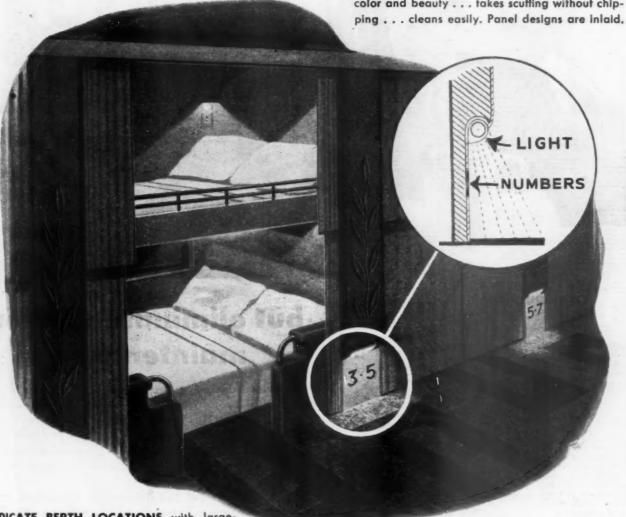
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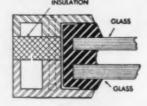
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for passenger cars

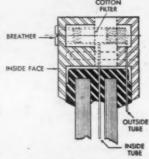


CONSTRUCTION DETAILS

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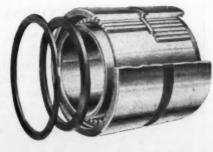
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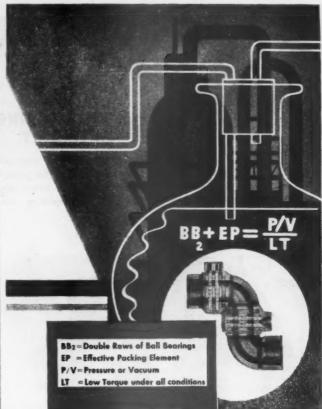
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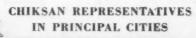


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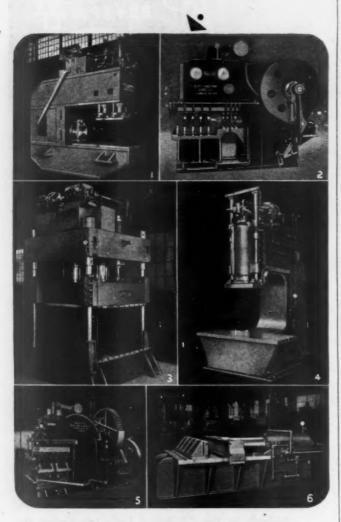
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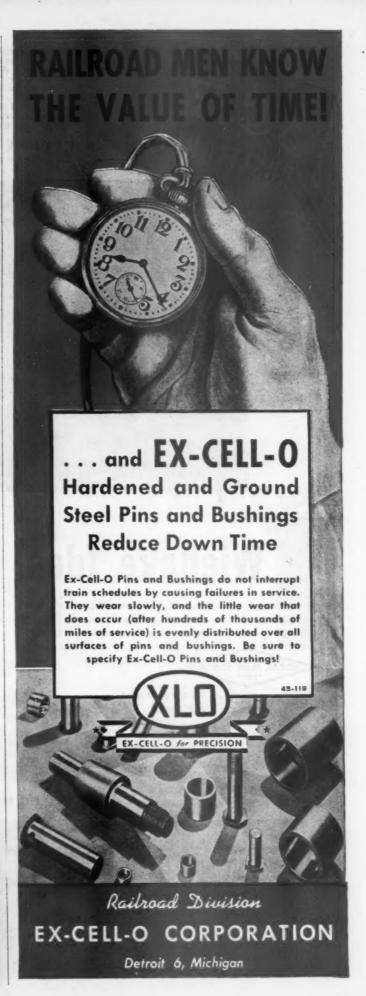
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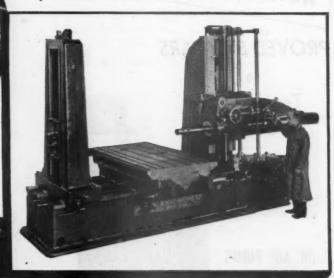
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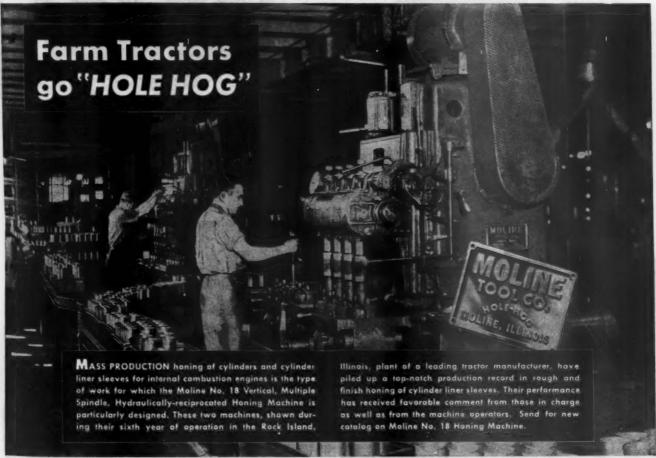
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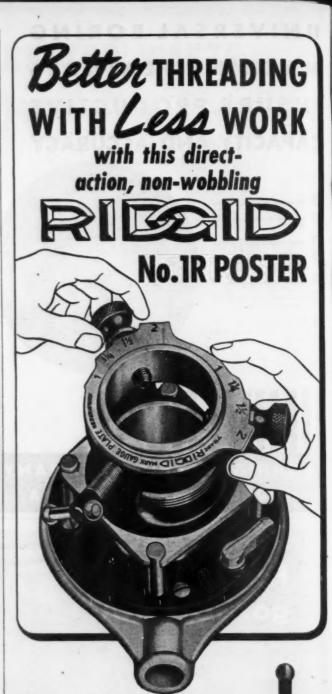
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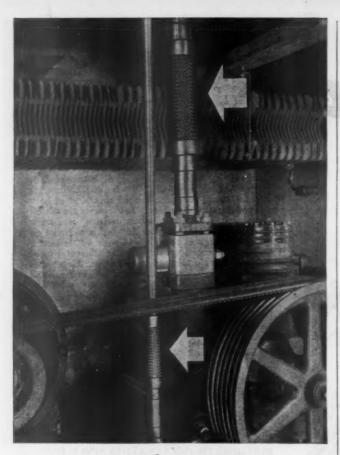
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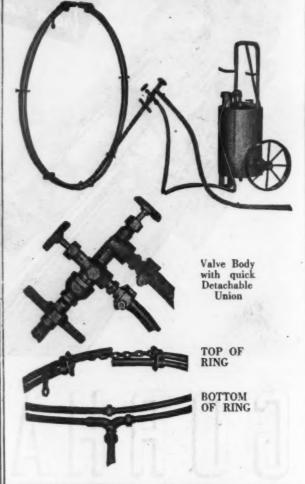
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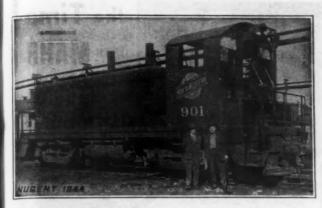
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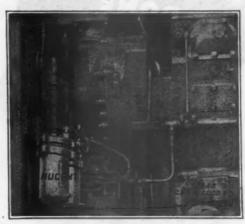
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EST. 1897

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. . . and perfect filtration. That's the performance record of a NUGENT Duplex Fuel Oil Filter installed on the Diesel switching locomotive shown at left.





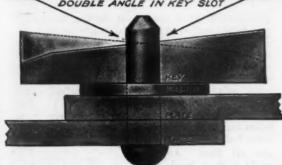
The above view shows the Nugent Duplex Fuel Oil Filters installed in the Diesel locomotive shown at the left. The throw away type filter recharge used in these filters is easily and quickly inserted in the filter cage, assuring the user of constant, thorough filtering.

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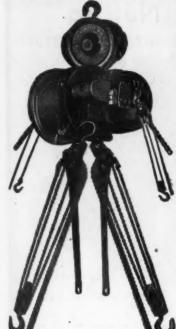
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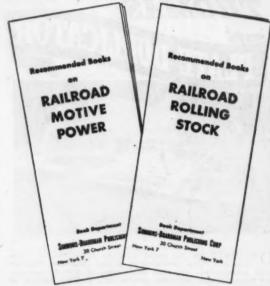


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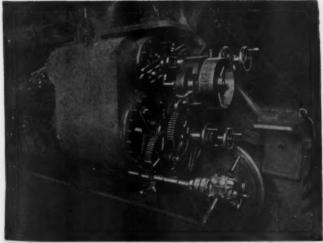
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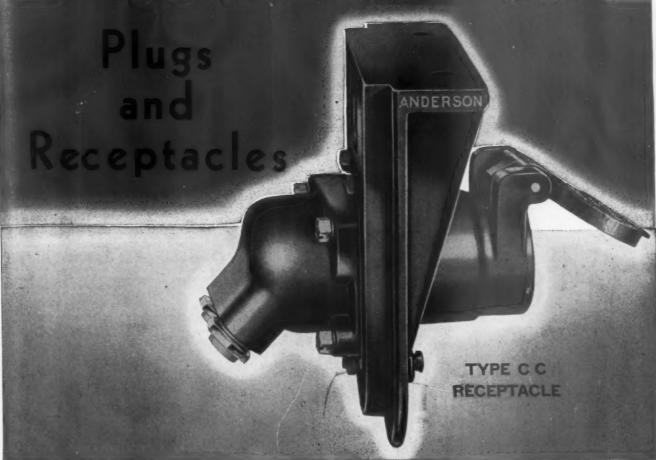
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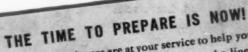
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